EXHIBIT I

PTO/AIA/50 (10-17)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

REISSUE PATENT APPLICATION TRANSMITTAL

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Attorney Docket No.	3564.015REI0
First Named Inventor	Jeffrey Wilde
Original Patent Number	RE42,678
Original Patent Issue Date (Month/Day/Year)	September 6, 2011
Priority Mail Express® Label No.	

APPLICATION FOR REISSUE OF:
(Check applicable box) [X] Utility Patent [ ] Design Patent [ ] Plant Patent

APPLICATION ELEMENTS (37 CFR 1.173)

1. [ ] **Fee Transmittal Form** (PTO/SB/56)
2. [ ] **Applicant asserts small entity status.** See 37 CFR 1.27
3. [ ] **Applicant certifies micro entity status.** See 37 CFR 1.29. Applicant must attach form PTO/SB/15A or B or equivalent.
4. [X] **Specification and Claims** in double column copy of patent format *(amended, if appropriate)*
5. [X] **Drawing(s)** *(proposed amendments, if appropriate)*
6. [X] **Reissue Oath/Declaration or Substitute Statement** (37 CFR 1.175) (PTO/AIA/05, 06, or 07)
7. [X] **Application Data Sheet** **NOTE:** Benefit claims under 37 CFR 1.78 and foreign priority claims under 37 CFR 1.55 MUST be set forth in an Application Data Sheet (ADS).
8. [X] **Original U.S. Patent currently assigned?** [X] Yes [ ] No *(If Yes, check applicable box(es))*
   - [X] Written Consent of all Assigness (PTO/AIA/53)
   - [X] 37 CFR 3.73(c) Statement (PTO/AIA/96)
9. [ ] **CD-ROM or CD-R** in duplicate, Computer Program *(Appendix)* or large table
   - [ ] Landscape Table on CD
10. **Nucleotide and/or Amino Acid Sequence Submission** *(if applicable, items a. – c. are required)*
   - a. [ ] Computer Readable Form (CRF)
   - b. [ ] Specification Sequence Listing on:
     - i. [ ] CD-ROM (2 copies) or CD-R (2 copies); **or**
     - ii. [ ] Paper
   - c. [ ] Statements verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

11. [X] **Statement of status and support for all changes to the claims.** See 37 CFR 1.173(c).
12. [X] **Power of Attorney**
13. [ ] **Information Disclosure Statement (IDS)** PTOSB/08 or PTO-1449
   - [ ] Copies of citations attached
14. [ ] **English translation of Reissue Oath/Declaration** *(if applicable)*
15. [ ] **Return Receipt Postcard** (MPEP § 503) (Should be specifically itemized)
16. [X] **Preliminary Amendment** (37 CFR 1.173; MPEP § 1453)
17. [X] **Other:** Authorization Under 37 C.F.R. § 1.136(a)(3);

[ ] This is a continuation reissue or divisional reissue application (*i.e.*, a second or subsequent reissue application for the same issued patent). *(Check box if applicable.)*

18. CORRESPONDENCE ADDRESS

[X] The address associated with Customer Number: **26111** OR [ ] Correspondence address below

Name					
Address					
City		State		Zip Code	
Country		Telephone			
Email					

Signature	/Jason D. Eisenberg/	Date	June 29, 2018
Name (Print/Type)	Jason D. Eisenberg	Registration No.	43,447

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	Confirmation No.: To Be Assigned
Wilde *et al.*	Art Unit: To Be Assigned
Appl. No.: To Be Assigned *(Narrowing Reissue of U.S. Reissue Patent No. 42,678; Reissued Sept. 6, 2011)*	Examiner: To Be Assigned
Filed: Herewith	Atty. Docket: 3564.015REI0
For: **Reconfigurable Optical Add-Drop Multiplexers with Servo Control and Dynamic Spectral Power Management Capabilities**	

Preliminary Amendment in a Reissue Application Under 37 C.F.R. § 1.173(b), Support for all Changes to the Claims, and Status of Co-Pending Proceedings

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

In advance of prosecution, Capella Photonics, Inc. ("Applicant") submits the following amendments and remarks.

It is not believed that extensions of time or fees for net addition of claims are required beyond those that may otherwise be provided for in documents accompanying this paper. However, if additional extensions of time are necessary to prevent abandonment of this application, then such extensions of time are hereby petitioned under 37 C.F.R. § 1.136(a), and any fees required therefor (including fees for net addition of claims) are hereby authorized to be charged to our Deposit Account No. 19 0036.

Amendment to the Specification

Please add the following paragraph as the first sentence of the specification pursuant to 37 C.F.R. § 1.177:

<u>This is a reissue of U.S. Reissue Patent No. RE42,678 (U.S. App. No. 12/815,930 filed June 15, 2010), which is a reissue of U.S. Reissue Patent No. RE39,397 (U.S. App. No. 11/027,586 filed on December 31, 2004), which is a reissue of U.S. Patent No. 6,625,346 (U.S. App. No. 09/938,426 filed September 23, 2003).</u>

Amendments to the Claims

The claim identifiers below, or lack thereof, conform to the rules for reissue amendments of previously reissued patents set forth in 37 C.F.R. §§ 1.173(b)(2), (c), (d), and (e). *See* M.P.E.P. §§ 1411 and 1453 (II), (IV), (V), and (VI). The listing of claims will replace all prior versions and listings of the claims.

The listing of claims will replace all prior versions and listings of the claims.

1. (Reissue Patent Claim, Once Amended) A wavelength-separating-routing apparatus, comprising:

a) multiple fiber collimators, providing and serving as an input port for a multi-wavelength optical signal and a plurality of output ports;

b) a wavelength-separator, for separating said multi-wavelength optical signal from said fiber collimator input port into multiple spectral channels;

c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots; and

d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors *being pivotal about two axes and being* individually and continuously controllable to reflect [said] *corresponding received* spectral channels into any selected ones of said fiber collimator output ports *and to control the power of said received spectral channels coupled into said* fiber collimator *output ports*.

2. (Original Patent Claim, Once Amended) The wavelength-separating-routing apparatus of claim 1 further comprising a servo-control assembly, in communication with said channel micromirrors and said fiber collimator output ports, for providing control of said channel micromirrors and thereby maintaining a predetermined coupling of each reflected spectral channel into one of said fiber collimator output ports.

3. (Original Patent Claim, Once Amended) The wavelength-separating-routing apparatus of claim 2 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said fiber collimator output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors.

4. (Original Patent Claim) The wavelength-separating-routing apparatus of claim 3 wherein said servo-control assembly maintains said power levels at a predetermined value.

5. (Original Patent Claim, Once Amended) The wavelength-separating-routing apparatus of claim 1 further comprising an array of collimator-alignment mirrors, in optical communication with said wavelength-separator and said fiber collimators, for adjusting an alignment of said multi-wavelength optical signal from said fiber collimator input port and directing said reflected spectral channels into said fiber collimator output ports.

6. (Original Patent Claim) The wavelength-separating-routing apparatus of claim 5 wherein each collimator-alignment mirror is rotatable about one axis.

7. (Original Patent Claim) The wavelength-separating-routing apparatus of claim 5 wherein each collimator-alignment mirror is rotatable about two axes.

8. (Original Patent Claim) The wavelength-separating-routing apparatus of claim 5 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimators.

9. (Original Patent Claim) The wavelength-separating-routing apparatus of claim 1 wherein each channel micromirror is continuously pivotable about one axis.

10. (Original Patent Claim) The wavelength-separating-routing apparatus of claim 1 wherein each channel micromirror is pivotable about two axes.

11. (Original Patent Claim) The wavelength-separating-routing apparatus of claim 10 wherein said fiber collimators are arranged in a two-dimensional array.

12. (Original Patent Claim) The wavelength-separating-routing apparatus of claim 1 wherein each channel micromirror is a silicon micromachined mirror.

13. (Original Patent Claim) The wavelength-separating-routing apparatus of claim 1 wherein said fiber collimators are arranged in a one-dimensional array.

14. (Original Patent Claim) The wavelength-separating-routing apparatus of claim 1 wherein said beam-focuser comprises a focusing lens having first and second focal points.

15. (Original Patent Claim) The wavelength-separating-routing apparatus of claim 14 wherein said wavelength-separator and said channel micromirrors are placed respectively at said first and second focal points of said focusing lens.

16. (Original Patent Claim) The wavelength-separating-routing apparatus of claim 1 wherein said beam-focuser comprises an assembly of lenses.

17. (Original Patent Claim, Once Amended) The wavelength-separating-routing apparatus of claim 1 wherein said wavelength-separator comprises an element selected from the group consisting of ruled diffraction gratings, <u>holographic</u> [[halographic]] diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing gratings.

18. (Original Patent Claim) The wavelength-separating-routing apparatus of claim 1 further comprising a quarter-wave plate optically interposed between said wavelength-separator and said channel micromirrors.

19. (Original Patent Claim, Once Amended) The wavelength-separating-routing apparatus of claim 1 wherein each <u>fiber collimator</u> output port carries a single one of said spectral channels.

20. (Original Patent Claim, Once Amended) The wavelength-separating-routing apparatus of claim 19 further comprising one or more optical sensors, optically coupled to said fiber collimator output ports.

21. (Original Patent Claim, Once Amended) A servo-based optical apparatus comprising:

a) multiple fiber collimators, providing an input port for a multi-wavelength optical signal and a plurality of output ports;

b) a wavelength-separator, for separating said multi-wavelength optical signal from said fiber collimator input port into multiple spectral channels;

c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots; and

d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being individually controllable to reflect said spectral channels into selected ones of said fiber collimator output ports; and

e) a servo-control assembly, in communication with said channel micromirrors and said fiber collimator output ports, for maintaining a predetermined coupling of each reflected spectral channel into one of said fiber collimator output ports.

22. (Original Patent Claim, Once Amended) The servo-based optical apparatus of claim 21 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said fiber collimator output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors.

23. (Original Patent Claim) The servo-based optical apparatus of claim 22 wherein said servo-control assembly maintains said power levels at a predetermined value.

24. (Original Patent Claim, Once Amended) The servo-based optical apparatus of claim 21 further comprising an array of collimator-alignment mirrors, in optical communication with said wavelength-separator and said fiber collimators, for adjusting an alignment of said multi-wavelength optical signal from said <u>fiber collimator</u> input port and directing said reflected spectral channels into said <u>fiber collimator</u> output ports.

25. (Original Patent Claim) The servo-based optical apparatus of claim 24 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimators.

26. (Original Patent Claim) The servo-based optical apparatus of claim 24 wherein each collimator-alignment mirror is rotatable about at least one axis.

27. (Original Patent Claim) The servo-based optical apparatus of claim 21 wherein each channel micromirror is continuously pivotable about at least one axis.

28. (Original Patent Claim) The servo-based optical apparatus of claim 21 wherein each channel micromirror is a silicon micromachined mirror.

29. (Original Patent Claim) The servo-based optical apparatus of claim 21 wherein said wavelength-separator comprises an element selected from the group consisting of ruled diffraction gratings, holographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing prisms.

30. (Original Patent Claim) The servo-based optical apparatus of claim 21 wherein said beam-focuser comprises one or more lenses.

31. (Original Patent Claim, Once Amended) An optical apparatus comprising:

a) an array of fiber collimators, providing <u>and serving as</u> an input port for a multi-wavelength optical signal and a plurality of output ports;

b) a wavelength-separator, for separating said multi-wavelength optical signal from said fiber collimator input port into multiple spectral channels;

c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots;

d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being individually and continuously controllable to reflect said spectral channels into selected ones of said fiber collimator output ports; and

e) a one-dimensional array of collimator-alignment mirrors, for adjusting an alignment of said multi-wavelength optical signal from said fiber collimator input port and directing said reflected spectral channels into said fiber collimator output ports.

32. (Original Patent Claim, Once Amended) The optical apparatus of claim 31 further comprising a servo-control assembly, in communication with said channel micromirrors, said collimator-alignment mirrors, and said fiber collimator output ports, for providing control of said channel micromirrors along with said collimator-alignment mirrors and thereby maintaining a predetermined coupling of each reflected spectral channel into one of said fiber collimator output ports.

33. (Original Patent Claim, Once Amended) The optical apparatus of claim 32 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said fiber collimator output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors and said collimator-alignment mirrors.

34. (Original Patent Claim) The optical apparatus of claim 31 wherein each channel micromirror is continuously pivotable about at least one axis.

35. (Original Patent Claim) The optical apparatus of claim 31 wherein each collimator-alignment mirror is rotatable about at least one axis.

36. (Original Patent Claim) The optical apparatus of claim 31 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimators.

37. (Original Patent Claim, Once Amended) An optical apparatus comprising:

a) an array of fiber collimators, providing and serving as an input port for a multi-wavelength optical signal and a plurality of output ports;

b) a wavelength-separator, for separating said multi-wavelength optical signal from said fiber collimator input port into multiple spectral channels;

c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots;

d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being individually and continuously controllable to reflect said spectral channels into selected ones of said fiber collimator output ports; and

e) a two-dimensional array of collimator-alignment mirrors, for adjusting an alignment of said multi-wavelength optical signal from said fiber collimator input port and directing said reflected spectral channels into said fiber collimator output ports.

38. (Original Patent Claim, Once Amended) The optical apparatus of claim 37 further comprising a servo-control assembly, in communication with said channel micromirrors, and collimator-alignment mirrors, and said fiber collimator output ports, for providing control of said channel micromirrors along with said collimator-alignment mirrors and thereby maintaining a predetermined coupling of each reflected spectral channel into one of said fiber collimator output ports.

39. (Original Patent Claim, Once Amended) The optical apparatus of claim 38 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said fiber collimator output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors and said collimator-alignment mirrors.

40. (Original Patent Claim) The optical apparatus of claim 37 wherein each collimator-alignment mirror is rotatable about at least one axis.

41. (Original Patent Claim) The optical apparatus of claim 37 wherein each channel micromirror is continuously pivotable about at least one axis.

42. (Original Patent Claim) The optical apparatus of claim 41 wherein each channel micromirrors is pivotable about two axes, and wherein said fiber collimators are arranged in a two-dimensional array.

43. (Original Patent Claim) The optical apparatus of claim 37 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimators.

44. (Reissue Patent Claim, Once Amended) An optical system comprising a wavelength-separating-routing apparatus, wherein said wavelength-separating-routing apparatus includes:

a) an array of fiber collimators, providing and serving as an input port for a multi-wavelength optical signal and a plurality of output ports including a pass-through port and one or more drop ports;

b) a wavelength-separator, for separating said multi-wavelength optical signal from said fiber collimator input port into multiple spectral channels;

c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots; and

d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being *pivotal about two axes and being* individually and continuously [pivotable] *controllable* to reflect [said] *corresponding received* spectral channels into *any* selected ones of said fiber collimator output ports *and to control the power of said received spectral channels coupled into said*

fiber collimator *output ports*, whereby said fiber collimator pass-through port receives a subset of said spectral channels.

45. (Original Patent Claim, Once Amended) The optical system of claim 44 further comprising a servo-control assembly, in communication with said channel micromirrors and said fiber collimator output ports, for providing control of said channel micromirrors and thereby maintaining a predetermined coupling of each reflected spectral channel into one of said fiber collimator output ports.

46. (Original Patent Claim, Once Amended) The optical system of claim 45 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said fiber collimator output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors.

47. (Original Patent Claim, Once Amended) The optical system of claim 44 further comprising an array of collimator-alignment mirrors, in optical communication with said wavelength-separator and said fiber collimators, for adjusting an alignment of said multi-wavelength optical signal from said fiber collimator input port and directing said reflected spectral channels into said fiber collimator output ports.

48. (Original Patent Claim) The optical system of claim 47 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimators.

49. (Original Patent Claim) The optical system of claim 47 wherein each collimator-alignment mirror is rotatable about at least one axis.

50. (Original Patent Claim) The optical system of claim 44 wherein each channel micromirror is pivotable about at least one axis.

51. (Original Patent Claim) The optical system of claim 44 wherein each channel micromirror is a silicon micromachined mirror.

52. (Original Patent Claim) The optical system of claim 44 wherein said beam-focuser comprises a focusing lens having first and second focal points, and wherein said wavelength-separator and said channel micromirrors are placed respectively at said first and second focal points.

53. (Original Patent Claim) The optical system of claim 44 wherein said wavelength-separator comprises an element selected from the group consisting of ruled diffraction gratings, holographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing prisms.

54. (Original Patent Claim) The optical system of claim 44 further comprising a quarter-wave plate optically interposed between said wavelength-separator and said channel micromirrors.

55. (Original Patent Claim, Once Amended) The optical system of claim 44 further comprising an auxiliary wavelength-separating-routing apparatus, including:

a) multiple auxiliary fiber collimators, providing <u>and serving as</u> a plurality of auxiliary input ports and an exiting port;

b) an auxiliary wavelength-separator;

c) an auxiliary beam-focuser; and

d) a spatial array of auxiliary channel micromirrors;

wherein said subset of said spectral channels in said <u>fiber collimator</u> pass-through port and one or more add spectral channels are directed into said <u>fiber collimator</u> auxiliary input ports, and multiplexed into an output optical signal directed into said <u>fiber collimator</u> exiting port by way of said auxiliary wavelength-separator, said auxiliary beam-focuser and said auxiliary channel micromirrors.

56. (Original Patent Claim) The optical system of claim 55 wherein said auxiliary channel micromirrors are individually pivotable.

57. (Original Patent Claim) The optical system of claim 55 wherein each auxiliary channel micromirror is pivotable continuously about at least one axis.

58. (Original Patent Claim) The optical system of claim 55 wherein each auxiliary channel micromirror is a silicon micromachined mirror.

59. (Original Patent Claim) The optical system of claim 55 wherein said auxiliary wavelength-separator comprises an element selected from the group consisting of ruled diffraction gratings, holographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing prisms.

60. (Original Patent Claim, Once Amended) The optical system of claim 55 wherein said fiber collimator pass-through port constitutes one of said fiber collimator auxiliary input ports.

61. (Reissue Patent Claim, Once Amended) A method of performing dynamic wavelength separating and routing, comprising:

a) receiving a multi-wavelength optical signal from [[an]] a fiber collimator input port;

b) separating said multi-wavelength optical signal into multiple spectral channels;

c) focusing said spectral channels onto a spatial array of corresponding beam-deflecting elements, whereby each beam-deflecting element receives one of said spectral channels; and

d) dynamically and continuously controlling said beam-deflecting elements[, thereby directing] *in two dimensions to direct* said spectral channels into [a plurality] *any selected ones* of [[*said*]] fiber collimator output ports *and to control the power of the spectral channels coupled into said selected* fiber collimator *output ports*.

62. (Reissue Patent Claim, Once Amended) The method of claim 61 further comprising the step of providing feedback control of said beam-deflecting elements[, thereby maintaining] *to maintain* a predetermining coupling of each spectral channel directed into one of said fiber collimator output ports.

63. (Original Patent Claim, Once Amended) The method of claim 62 further comprising the step of maintaining power levels of said spectral channels directed into said fiber collimator output ports at a predetermining value.

64. (Original Patent Claim, Once Amended) The method of claim 61 wherein each spectral channel is directed into a separate fiber collimator output port.

65. (Original Patent Claim, Once Amended) The method of claim 61 wherein a subset of said spectral channels is directed into one of said fiber collimator output ports, thereby providing one or more pass-through spectral channels.

66. (Original Patent Claim) The method of claim 65 further comprising the step of multiplexing said pass-through spectral channels with one or more add spectral channels, so as to provide an output optical signal.

67. (Original Patent Claim) The method of claim 61 wherein said beam-deflecting elements comprise an array of silicon micromachined mirrors.

68. (New) The wavelength-separating-routing apparatus of claim 1, wherein neither said multi-wavelength optical signal nor said spectral channels are transmitted through a circulator.

69. (New) The servo-based optical apparatus of claim 21, wherein neither said multi-wavelength optical signal nor said spectral channels are transmitted through a circulator.

70. (New) The optical apparatus of claim 31, wherein neither said multi-wavelength optical signal nor said spectral channels are transmitted through a circulator.

71. (New) The optical apparatus of claim 37, wherein neither said multi-wavelength optical signal nor said spectral channels are transmitted through a circulator.

72. (New) The optical system of claim 44, wherein neither said multi-wavelength optical signal nor said spectral channels are transmitted through a circulator.

Remarks

Status of the Claims and Support for Added Claims Under 37 C.F.R. § 1.173(c)

Upon entry of the foregoing amendment, claims 1-72 are pending in the application, with claims 1, 21, 31, 37, 44, and 61 being the independent claims. Claims 1-3, 5, 17, 19-22, 24, 31-33, 37-38, 44-47, 55, and 60-65 are sought to be amended. New claims 68-72 are sought to be added. The amended and added claims are believed to introduce no new matter, and their entry is respectfully requested.

Specific support for all amended and new claims is listed below. However, support for each of these new claims can be found throughout the originally-filed application, which issued as U.S. Patent No. 6,625,346 to Wilde *et al.*

New/Amended Claims	Exemplary Support[1]
1, 44, and 61	3:54-57, 4:7-14, 4:26-27, 5:20-22, 6:54-60, 7:6-11, 11:26-30, 12:45-48, 13:1-12
2, 32, 38, 45	4:30-44, 11:5-57
3, 22, 33, 39, and 46	11:5-57
5, 19, 24, and 64	9:34-58
17	4:15-20
20	11:65-67, 12:29-36
21	3:54-57, 4:7-14, 4:26-44, 5:20-22, 6:54-60, 7:6-11, 11:5-57, 12:45-48, 13:1-12
31 and 37	3:54-57, 4:7-14, 4:26-27, 5:20-22, 6:54-60, 7:6-11, 9:34-58, 11:26-30, 12:45-48, 13:1-12
47	9:34-58, 11:26-30
55	3:54-57, 4:26-27, 5:20-22, 6:54-60, 7:6-11, 11:26-30, 12:45-48, 13:1-12, 13:33-39
60	3:54-57, 4:26-27, 5:20-22, 6:54-60, 7:6-11, 11:26-30, 12:45-48, 13:1-12, 13:30-33
62	11:21-26
63	11:30-34
65	3:54-57, 4:26-27, 5:20-22, 6:54-60, 12:45-48, 13:1-12
68-72	3:6-9

[1] Citations are to RE42,678 as published.

Status of Co-Pending Proceedings under 37 C.F.R. § 1.178(b)

This is a reissue application of U.S. Reissue Patent No. RE42,678, which is a reissue of U.S. Reissue Patent No. RE39,397, which is a reissue of U.S. Patent No. 6,625,346.[2]

RE42,678 is related to U.S. Reissue Patent No. RE42,368. A reissue application (U.S. Appl. No. *to be assigned*) has been filed for RE42,368.

The Patent Trial and Appeal Board ("PTAB") issued Final Written Decisions in the following *inter partes* reviews filed against certain claims of RE42,678 and RE42,368. Applicant appealed all the PTAB's decisions to the Court of Appeals for the Federal Circuit. *See Capella Photonics, Inc. v. Cisco Sys., Inc.* (June 23, 2017) (Nos. 2016-2394, -2395, 2017-1105, -1106, -1107, -1108). All the appeals were consolidated into a single appeal, the Court affirmed the PTAB, and the Court denied Capella's rehearing request. On June 28, 2018, Capella filed a motion with the Supreme Court to extend the July 9, 2018 deadline for filing a petition for a Writ of Certiorari by sixty days.

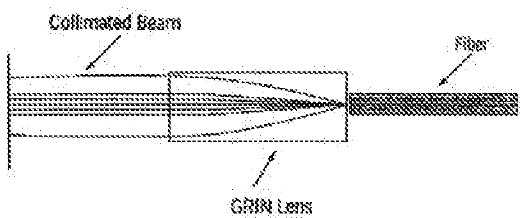
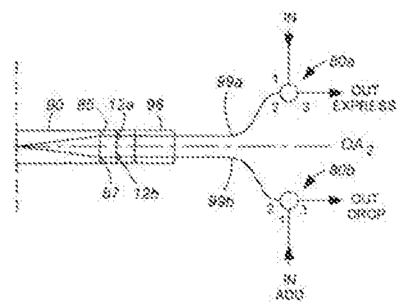
Inter Parts Review Proceedings	Status
IPR2014-01276 (RE42,678)	Appealed or to be appealed to the Supreme Court
IPR2015-00726 (RE42,368)	Appealed or to be appealed to the Supreme Court
IPR2015-00727 (RE42,678)	Appealed or to be appealed to the Supreme Court
IPR2015-00731 (RE42,368)	Appealed or to be appealed to the Supreme Court
IPR2015-00739 (RE42,678)	Appealed or to be appealed to the Supreme Court
IPR2015-00816 (RE42,368)—merged with IPR2014-01166.	Appealed or to be appealed to the Supreme Court
IPR2015-00894 (RE42,678)—merged with IPR2014-01276.	Appealed or to be appealed to the Supreme Court
IPR2015-01958 (RE42,368)—merged with IPR2015-00726.	Appealed or to be appealed to the Supreme Court
IPR2015-01961 (RE42,678)—merged with IPR2015-00727.	Appealed or to be appealed to the Supreme Court
IPR2015-01969 (RE42,368)—merged with IPR2015-00731.	Appealed or to be appealed to the Supreme Court
IPR2015-01971 (RE42,678)—merged with IPR2015-00739.	Appealed or to be appealed to the Supreme Court

[2] RE39,397 did not include any claim amendments.

Proper Claim Construction of "Port"

In its Final Written Decisions, the PTAB alleged that U.S. Patent No. 6,498,872 to Bouevitch et al. ("Bouevitch") taught "ports" as claimed in RE42,678 because the PTAB alleged RE42,678 did not disavow circulator ports or define "port" to have a specific meaning. *See, e.g.*, IPR2014-01276, Final Written Decision, Paper 40 at 14-16 (PTAB Feb. 17, 2016). Applicant respectfully disagrees and has appealed the PTAB's allegation to the Court of Appeals for the Federal Circuit.

As shown below, the ports described in RE42,678 are collimator ports, whereas the IN, OUT EXPRESS, OUT/DROP, and IN/ADD in Bouevitch are circulator ports.

RE42,678 Collimator Ports	**Bouevitch Circulator Ports**
 *See* Specification, FIG. 1D; *see also id.* at 8:41-43 ("Each output port is provided by a quarter-pitch GRIN lens . . . coupled to an optical fiber (see FIG. 1D).").	 *See* Bouevitch, FIG. 11 (showing GRIN lens 90 and circulators 80a and 80b coupled to waveguides 99a and 99b).

As explained below, the claimed ports should not be construed to encompass circulator ports, such as the circulator ports in Bouevitch, for at least three reasons.

1. The Term "Port in View of the Specification

The '678 Patent unambiguously uses collimator ports, not circulator ports.

The '678 Patent generally discusses two classes of ports: input ports and output ports. Input ports include add ports and pass-through ports. *See, e.g.*, Specification, 13:31-33 ("the pass-through port 630 and the add ports 660-1 through 660-M constitute the input ports"). Output ports include drop ports and also pass-through ports. *See, e.g.*, Specification, 5:20-22 ("The output ports of the first WSR-S (or WSR) apparatus include a pass-through port and one or more drop ports."), 12:46-48 ("a plurality of output ports, including a pass-through port 530 and one or more drop ports 540-1 through 540-N (N ≥1)").

The specification of the '678 Patent defines ports in the "Summary of the Invention" to be fiber collimators that serve as both the input ports and the output ports. According to the very first sentence in the Summary of the Invention, "***[t]he present invention*** . . . employ[s] an array of fiber collimators serving as an input port and a plurality of output ports." Specification, 3:54-57 (emphasis added). The appearance of this definition "in the 'Summary of the Invention' section makes it 'more likely' a description of the invention as a whole." *Sevenson Envtl. Servs., Inc. v. United States*, 76 Fed. Cl. 51, 69 (Fed. Cl. 2007) (citing *C.R. Bard, Inc. v. U.S. Surgical Corp.*, 388 F.3d 858, 864 (Fed. Cir. 2004)). The fact that the very first sentence of the Summary of the Invention expressly provides that fiber collimators are the physical structure of ports is compelling evidence that the claimed ports must be fiber collimators. *See C.R. Bard*, 388 F.3d at 864 (finding that when the Summary of the Invention states that "[t]he implant includes a pleated surface," the "patent requires the 'implant' . . . to have a pleated surface." (citation omitted)).

Additionally, because the physical structure provided for "port" in the Summary of the Invention is consistent with the characterization of port in the specification as a whole, "it is apparent that the patentee was not merely providing examples of the invention, but rather that the patentee intended for" the term port to have a fiber collimator physical structure. *See Sevenson Envtl. Servs.*, 76 Fed. Cl. at 69. "[The Federal Circuit] has indicated that a statement in a specification that describes the invention as a whole can support a limiting construction of a claim term. That is especially true where, as here, other statements and illustrations in the patent are consistent with the limiting description." *Am. Piledriving*

Equip., Inc. v. Geoquip, Inc., 637 F.3d 1324, 1334 (Fed. Cir. 2011) (citing *C.R. Bard*, 388 F.3d at 864).

The specification as a whole leaves no ambiguity: fiber collimators serve as the physical structure of the claimed ports. The specification repeatedly makes this relationship clear. *See, e.g.*, Specification, 4:26-27 ("The fiber collimators serving as the input and output ports"), 8:35-36 ("the fiber collimator serving as the output port"), 9:20-21 ("The fiber collimators serving as the input and output ports"), 9:62-63 ("the fiber collimators (serving as the input and output ports)"), 10:29-32 (In FIG. 3, "the one-dimensional fiber collimator array 110 of FIG. 2B is replaced by a two-dimensional array 350 of fiber collimators, providing for an input-port and a plurality of output ports."), 10:52-53 ("the fiber collimators that provide for the input and output ports"), 2:44 ("port/fiber"), 8:33-34 (output ports have a "fiber core"). Thus, "[t]he specification's use of the word ['port'] leaves no doubt about its meaning." *See PPC Broadband, Inc. v. Corning Optical Commc'ns RF, LLC*, 815 F.3d 747, 753 (Fed. Cir. 2016).

Similarly, this characterization of "port" as a "fiber collimator" is reinforced by the description of the patent's figures. The specification explains that Figure 1A, which is also printed on the face of the '678 Patent, depicts an apparatus that includes "an array of fiber collimators 110, providing an input port 110-1 and a plurality of output ports 110-2 through 110-N (N≥3)." ('678 Patent, 6:58-60.) In discussing 110-1 through 110-N, the specification uses the term "port" and its "fiber collimator" structure interchangeably. *See, e.g.*, Specification, 6:65 ("input port 110-1"), 7:9-10 ("output ports 110-2 through 110-N"), 8:19-20 ("output ports 110-2 through 110-N"), 10:14 ("fiber collimators 110-1 through 110-N"), 10:21 ("fiber collimators 110-1 through 110-N").[3] Thus, both the description of the figure and the description of the figure's components (110, 110-1 through 110-N) delineate the physical structure of "port" as a fiber collimator. An annotated version of Figure 1A is reproduced below.

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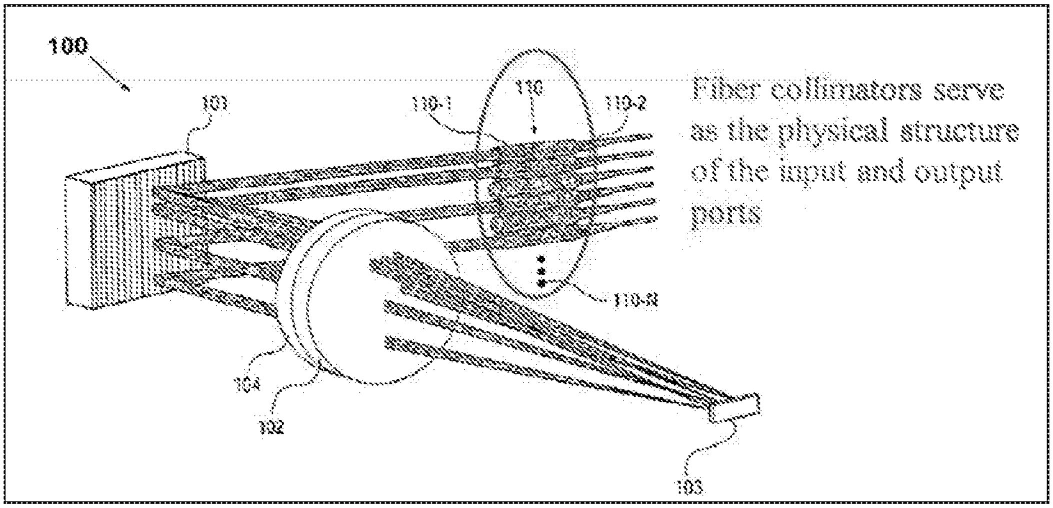
[3] Figures 2A and 2B also use the 110 and 110-1 through 110-N nomenclature.



2. Negative Limitations

The claimed ports exclude circulator ports because the new claims in this application narrowly define the term "port." Several new claims recite a negative limitation. Claims 67 to 72 "wherein neither said multi-wavelength optical signal nor said spectral channels are transmitted through a circulator." These claim elements must be given patentable weight because all words in a claim must be considered—including negative limitations. *See In re Wilson*, 424 F.2d 1382, 1385 (C.C.P.A. 1970) ("All words in a claim must be considered in judging the patentability of that claim against the prior art."); *Ex parte Waghray*, Appeal No. 2011-007825, Appl. No. 11/433,547 (B.P.A.I., Sept. 18, 2012); *Ex parte Gilbert*, Appeal No. 2000-001741, Appl. No. 08/654,401 ("Albeit a negative limitation, this is still a claim limitation which must be considered by the examiner when evaluating the prior art which is applied against the claims.") (B.P.A.I., Jul. 31, 2002); *Ex Parte Deen*, Appeal No. 2008-001005, Appl. No. 11/175,231, p. 7 (B.P.A.I., Nov. 26, 2008) ("that when a reference fails to teach a negative limitation, such limitation cannot be assumed to be inherent to that reference simply by virtue of its negative nature."). Several new claims recite a negative limitation excluding circulators, so these claims exclude circulator ports.

3. Manifest Statement of Disavowal

The claimed ports exclude circulator ports because the patent owner unequivocally makes the following manifest statement of disavowal: The meaning of input port, output port, add port, drop port, and other ports in this reissue application does **not** encompass a "circulator port."[4] In the instance of disavowal, the prosecution history can compel departure from the plain meaning of a claim term. *Pacing Techs., LLC v. Garmin Int'l, Inc.*, 778 F.3d 1021, 1024 (Fed. Cir. 2015) (citation omitted). With this manifest statement of disavowal, Applicant has distinguished the ports in both the existing claims and the new claims—added herein or in future amendments—from circulator ports.

* * *

For at least these three reasons, the claimed "ports" have been differentiated from circulator ports, such as the circulator ports disclosed in Bouevitch.

U.S. Patent No. 6,798,941 to Smith et al. is Not Prior Art

In its Final Written Decisions, the PTAB alleged that U.S. Patent No. 6,798,941 to Smith et al. ("Smith") was prior art. *See, e.g.*, IPR2014-01276, Final Written Decision, Paper 40 at 20-25 (PTAB Feb. 17, 2016). Applicant respectfully disagrees even though the Federal Circuit affirmed the PTAB.

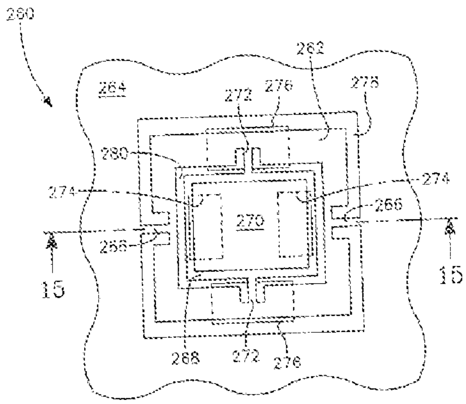
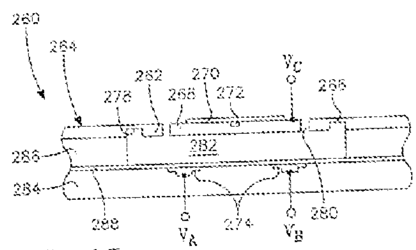
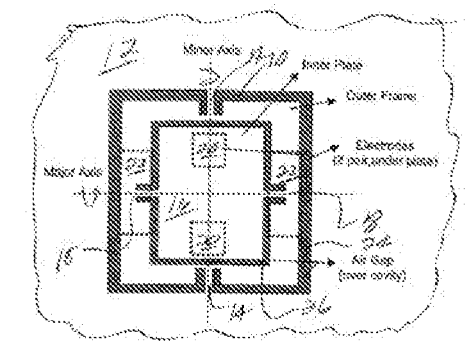
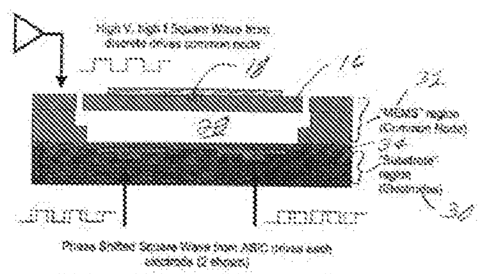
For Smith to be prior art, the effective filing date from one of the two following provisional applications must be relied upon: (1) U.S. Provisional Application No. 60/267,285 ("'285 Provisional") and (2) U.S. Provisional Application No. 60/234,683 ("'683 Provisional"). *Compare* Smith (filed September 20, 2001), *with* RE42,678 (priority back to

[4] A circulator could be coupled to (either upstream or downstream from) a claimed port. *See* U.S. Application No. 60/277,217, Specification at p. 3 ("Circulators are situated on all of the physical input/output ports, allowing for two-way optical propagation."), Drawings at FIG. 9; *see also* IPR2014-01276, Final Written Decision, Paper 44 at 16 (PTAB Feb. 17, 2016) (citing to disclosure in U.S. Application No. 60/277,217 for written support). But the claimed ports are unequivocally not circulator ports.

March 19, 2001). Neither the '285 Provisional nor the '683 Provisional can be relied upon for an earlier effective filing date.

Smith is not entitled to benefit from the filing date of the '285 Provisional because Smith and the '285 Provisional do not share common inventorship. A non-provisional patent application can only claim priority to a provisional application with common inventorship. *See* 35 U.S.C. §§ 119, 120; *see also* M.P.E.P. § 211. Here, the inventive entities are entirely different. *Compare* Smith (inventors David A. Smith, John E. Golub, and Fariborz Farhan), *with* '285 Provisional (inventors Steven L. Garverick and Michael L. Nagy). Smith is therefore not entitled to benefit from the filing date of the '285 Provisional.

Smith is also not entitled to benefit from the filing date of the '683 Provisional. Smith is not entitled to benefit from this filing date because the movable mirror disclosed in the '683 Provisional was not carried forward into the Smith patent. The law has held for at least thirty-four years that a patent is prior art as of its earliest effective filing date only for subject matter carried forward from the earliest application. *See In re Lund*, 376 F.2d 982, 988 (C.C.P.A. 1967) ("the continuation-in-part application is entitled to the filing date of the parent application as to all subject matter carried forward into it from the parent application, whether for purposes of obtaining a patent or subsequently utilizing the patent disclosure as evidence to defeat another's right to a patent."). The Federal Circuit has extended this principle to patents claiming priority to provisional applications. *See In re Giacomini*, 612 F.3d 1380, 1383-84 (Fed. Cir. 2010); *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1381 (Fed. Cir. 2015) (citing *In re Wertheim*, 646 F.2d 527, 537 (C.C.P.A. 1981)). Here, Smith's mirror structure is not entitled to the priority date of the '683 Provisional because the mirror disclosed in Smith was not carried forward from the '683 Provisional. Rather, the mirror structure was carried forward from the '285 Provisional, which Smith cannot claim benefit. As shown below, Smith's mirror is from the '285 Provisional—not the '683 Provisional.

Smith, FIGS. 14 and 15	**'285 Provisional, FIGS. 1 and 2**
 FIG. 14  FIG. 15	 

Smith, 14:57-65	**'285 Provisional**
The cell includes a gimbal structure of an outer frame 262 twistably supported in a support structure 264 of the MEMS array through a first pair of torsion beams 266 extending along and twisting about a minor axis. The cell further includes a mirror plate 268 having a reflective surface 270 twistably supported on the outer frame 262 through a second pair of torsion beams 272 arranged along a major axis perpendicular to the minor axis and twisting thereabout.	It includes a gimbal structure of an outer frame 10 twistably supported in the support structure 12 of the MEMS array through a first pair of torsion bars 14 extending along and twisting about a minor axis and a mirror plate 16 having a reflective surface twistably supported by the outer frame 10 through a second pair of torsion bars 18 arranged along a major axis perpendicular to the minor axis and twisting thereabout.

The '683 Provisional vaguely discloses a mirror, but this disclosure was left behind; it was not carried forward into the Smith patent. The '683 Provisional discloses "a mirror array with elements that can be rotated in an analog fashion about two orthogonal axes." '683 Provisional, p. 6. This disclosure, however, is entirely different than the disclosure that ended up in the Smith patent. The mirrors are different because the '683 Provisional has mirrors that can be rotated in an analog fashion whereas Smith's mirror moves in a step-wise digital fashion. *See* IPR2014-01276, Final Written Decision, Paper 40 at 31 (PTAB Feb. 17, 2016) ("Petitioner does not dispute that Smith relies on digital control."). The Smith patent never talks about a mirror rotated in an analog fashion. Rather, this disclosure was left behind. Since Smith cannot rely on the provisional application where Smith's mirror originated (i.e., the '285 Provisional), Smith is not entitled to an earlier effective filing date, at least with respect to a two-axis mirror.

* * *

Smith is not entitled to the filing date of the '285 Provisional because Smith and the '285 Provisional do not share common inventorship. And Smith is not entitled to the filing date of the '683 Provisional because Smith's mirror structure was not carried forward from the '683 Provisional. Since Smith is not entitled to an earlier effective filing date, the Office should not rely on Smith as a prior art reference.

Conclusion

Prompt and favorable consideration of this Preliminary Amendment is respectfully requested. Applicant believes the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

/Jason D. Eisenberg/

Robert Greene Sterne, Reg. No. 28,912
Jason D. Eisenberg, Reg. No. 43,447
Tyler J. Dutton, Reg. No. 75,069
Attorneys for Patent Owner

Date: June 29, 2018

1100 New York Avenue, N.W.
Washington, D.C. 20005-3934
(202) 371-2600

2789304_5

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re reissue application of:	Confirmation No.: 3621
Wilde *et al.*	Art Unit: 3992
Appl. No.: 16/023,183 *(Reissue of U.S. Reissue Patent No. 42,678; Reissued Sept. 6, 2011)*	Examiner: Deandre M. Hughes
Filed: June 29, 2018	Atty. Docket: 3564.015REI0
For: **Reconfigurable Optical Add-Drop Multiplexers with Servo Control and Dynamic Spectral Power Management Capabilities**	

Second Preliminary Amendment in a Reissue Application Under 37 C.F.R. § 1.173(b), Support for all Changes to the Claims, and Status of Co-Pending Proceedings

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

In advance of prosecution, Capella Photonics, Inc. ("Applicant") submits the following amendments and remarks as a Second Preliminary Amendment to supersede and replace a first file Preliminary Amendment that was made obsolete by a PTAB certificate issued for this patent.

It is not believed that extensions of time or fees for net addition of claims are required beyond those that may otherwise be provided for in documents accompanying this paper. However, if additional extensions of time are necessary to prevent abandonment of this application, then such extensions of time are hereby petitioned under 37 C.F.R. § 1.136(a), and any fees required therefor (including fees for net addition of claims) are hereby authorized to be charged to our Deposit Account No. 19 0036.

Amendment to the Specification

Please add the following paragraph as the first sentence of the specification pursuant to 37 C.F.R. § 1.177:

This is a reissue of U.S. Reissue Patent No. RE42,678 (U.S. App. No. 12/815,930 filed June 15, 2010), which is a reissue of U.S. Reissue Patent No. RE39,397 (U.S. App. No. 11/027,586 filed on December 31, 2004), which is a reissue of U.S. Patent No. 6,625,346 (U.S. App. No. 09/938,426 filed September 23, 2003).

Amendments to the Claims

The claim identifiers below, or lack thereof, conform to the rules for reissue amendments of previously reissued patents set forth in 37 C.F.R. §§ 1.173(b)(2), (c), (d), and (e). *See* M.P.E.P. §§ 1411 and 1453 (II), (IV), (V), and (VI). The listing of claims will replace all prior versions and listings of the claims.

The listing of claims will replace all prior versions and listings of the claims.

~~1. A wavelength-separating-routing apparatus, comprising:~~

~~a) multiple fiber collimators, providing an input port for a multi-wavelength optical signal and a plurality of output ports;~~

~~b) a wavelength-separator, for separating said multi-wavelength optical signal from said input port into multiple spectral channels;~~

~~c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots; and~~

~~d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors *being pivotal about two axes and being* individually and continuously controllable to reflect [said] *corresponding received* spectral channels into any selected ones of said output ports *and to control the power of said received spectral channels coupled into said output ports*.~~

~~2. The wavelength-separating-routing apparatus of claim 1 further comprising a servo-control assembly, in communication with said channel micromirrors and said output ports, for providing control of said channel micromirrors and thereby maintaining a predetermined coupling of each reflected spectral channel into one of said output ports.~~

~~3. The wavelength-separating-routing apparatus of claim 2 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors.~~

~~4. The wavelength-separating-routing apparatus of claim 3 wherein said servo-control assembly maintains said power levels at a predetermined value.~~

~~5. The wavelength-separating-routing apparatus of claim 1 further comprising an array of collimator-alignment mirrors, in optical communication with said wavelength-separator and said fiber collimators, for adjusting an alignment of said multi-wavelength optical signal from said input port and directing said reflected spectral channels into said output ports.~~

~~6. The wavelength-separating-routing apparatus of claim 5 wherein each collimator-alignment mirror is rotatable about one axis.~~

~~7. The wavelength-separating-routing apparatus of claim 5 wherein each collimator-alignment mirror is rotatable about two axes.~~

~~8. The wavelength-separating-routing apparatus of claim 5 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimators.~~

~~9. The wavelength-separating-routing apparatus of claim 1 wherein each channel micromirror is continuously pivotable about one axis.~~

~~10. The wavelength-separating-routing apparatus of claim 1 wherein each channel micromirror is pivotable about two axes.~~

~~11. The wavelength-separating-routing apparatus of claim 10 wherein said fiber collimators are arranged in a two-dimensional array.~~

~~12. The wavelength-separating-routing apparatus of claim 1 wherein each channel micromirror is a silicon micromachined mirror.~~

~~13. The wavelength-separating-routing apparatus of claim 1 wherein said fiber collimators are arranged in a one-dimensional array.~~

~~14. The wavelength-separating-routing apparatus of claim 1 wherein said beam-focuser comprises a focusing lens having first and second focal points.~~

~~15. The wavelength-separating-routing apparatus of claim 14 wherein said wavelength-separator and said channel micromirrors are placed respectively at said first and second focal points of said focusing lens.~~

~~16. The wavelength-separating-routing apparatus of claim 1 wherein said beam-focuser comprises an assembly of lenses.~~

~~17. The wavelength-separating-routing apparatus of claim 1 wherein said wavelength-separator comprises an element selected from the group consisting of ruled diffraction gratings, halographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing gratings.~~

~~18. The wavelength-separating-routing apparatus of claim 1 further comprising a quarter-wave plate optically interposed between said wavelength-separator and said channel micromirrors.~~

~~19. The wavelength-separating-routing apparatus of claim 1 wherein each output port carries a single one of said spectral channels.~~

~~20. The wavelength-separating-routing apparatus of claim 19 further comprising one or more optical sensors, optically coupled to said output ports.~~

~~21. A servo-based optical apparatus comprising:~~

~~a) multiple fiber collimators, providing an input port for a multi-wavelength optical signal and a plurality of output ports;~~

~~b) a wavelength-separator, for separating said multi-wavelength optical signal from said input port into multiple spectral channels;~~

~~c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots; and~~

~~d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being individually controllable to reflect said spectral channels into selected ones of said output ports; and~~

~~e) a servo-control assembly, in communication with said channel micromirrors and said output ports, for maintaining a predetermined coupling of each reflected spectral channel into one of said output ports.~~

~~22. The servo-based optical apparatus of claim 21 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors.~~

~~23. The servo-based optical apparatus of claim 22 wherein said servo-control assembly maintains said power levels at a predetermined value.~~

~~24. The servo-based optical apparatus of claim 21 further comprising an array of collimator-alignment mirrors, in optical communication with said wavelength-separator and said fiber collimators, for adjusting an alignment of said multi-wavelength optical signal from said input port and directing said reflected spectral channels into said output ports.~~

~~25. The servo-based optical apparatus of claim 24 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimators.~~

~~26. The servo-based optical apparatus of claim 24 wherein each collimator-alignment mirror is rotatable about at least one axis.~~

~~27. The servo-based optical apparatus of claim 21 wherein each channel micromirror is continuously pivotable about at least one axis.~~

~~28. The servo-based optical apparatus of claim 21 wherein each channel micromirror is a silicon micromachined mirror.~~

~~29. The servo-based optical apparatus of claim 21 wherein said wavelength-separator comprises an element selected from the group consisting of ruled diffraction gratings, holographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing prisms.~~

~~30. The servo-based optical apparatus of claim 21 wherein said beam-focuser comprises one or more lenses.~~

~~31. An optical apparatus comprising:~~

~~a) an array of fiber collimators, providing an input port for a multi-wavelength optical signal and a plurality of output ports;~~

~~b) a wavelength-separator, for separating said multi-wavelength optical signal from said input port into multiple spectral channels;~~

~~c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots;~~

~~d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being individually and continuously controllable to reflect said spectral channels into selected ones of said output ports; and~~

~~e) a one-dimensional array of collimator-alignment mirrors, for adjusting an alignment of said multi-wavelength optical signal from said input port and directing said reflected spectral channels into said output ports.~~

~~32. The optical apparatus of claim 31 further comprising a servo-control assembly, in communication with said channel micromirrors, said collimator-alignment mirrors, and said output ports, for providing control of said channel micromirrors along with said collimator-alignment mirrors and thereby maintaining a predetermined coupling of each reflected spectral channel into one of said output ports.~~

~~33. The optical apparatus of claim 32 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors and said collimator-alignment mirrors.~~

~~34. The optical apparatus of claim 31 wherein each channel micromirror is continuously pivotable about at least one axis.~~

~~35. The optical apparatus of claim 31 wherein each collimator-alignment mirror is rotatable about at least one axis.~~

~~36. The optical apparatus of claim 31 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimators.~~

~~37. An optical apparatus comprising:~~

~~a) an array of fiber collimators, providing an input port for a multi-wavelength optical signal and a plurality of output ports;~~

~~b) a wavelength-separator, for separating said multi-wavelength optical signal from said input port into multiple spectral channels;~~

~~c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots;~~

~~d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being~~

~~individually and continuously controllable to reflect said spectral channels into selected ones of said output ports; and~~

~~e) a two-dimensional array of collimator-alignment mirrors, for adjusting an alignment of said multi-wavelength optical signal from said input port and directing said reflected spectral channels into said output ports.~~

~~38. The optical apparatus of claim 37 further comprising a servo-control assembly, in communication with said channel micromirrors, and collimator-alignment mirrors, and said output ports, for providing control of said channel micromirrors along with said collimator-alignment mirrors and thereby maintaining a predetermined coupling of each reflected spectral channel into one of said output ports.~~

~~39. The optical apparatus of claim 38 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors and said collimator-alignment mirrors.~~

~~40. The optical apparatus of claim 37 wherein each collimator-alignment mirror is rotatable about at least one axis.~~

~~41. The optical apparatus of claim 37 wherein each channel micromirror is continuously pivotable about at least one axis.~~

~~42. The optical apparatus of claim 41 wherein each channel micromirrors is pivotable about two axes, and wherein said fiber collimators are arranged in a two-dimensional array.~~

~~43. The optical apparatus of claim 37 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimators.~~

~~44. An optical system comprising a wavelength-separating-routing apparatus, wherein said wavelength-separating-routing apparatus includes:~~

~~a) an array of fiber collimators, providing an input port for a multi-wavelength optical signal and a plurality of output ports including a pass-through port and one or more drop ports;~~

~~b) a wavelength-separator, for separating said multi-wavelength optical signal from said input port into multiple spectral channels;~~

~~c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots; and~~

~~d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being *pivotal about two axes and being* individually and continuously [pivotable] *controllable* to reflect [said] *corresponding received* spectral channels into *any* selected ones of said output ports *and to control the power of said received spectral channels coupled into said output ports*, whereby said pass-through port receives a subset of said spectral channels.~~

~~45. The optical system of claim 44 further comprising a servo-control assembly, in communication with said channel micromirrors and said output ports, for providing control of said channel micromirrors and thereby maintaining a predetermined coupling of each reflected spectral channel into one of said output ports.~~

~~46. The optical system of claim 45 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors.~~

~~47. The optical system of claim 44 further comprising an array of collimator-alignment mirrors, in optical communication with said wavelength-separator and said fiber collimators, for adjusting an alignment of said multi-wavelength optical signal from said input port and directing said reflected spectral channels into said output ports.~~

~~48. The optical system of claim 47 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimators.~~

~~49. The optical system of claim 47 wherein each collimator-alignment mirror is rotatable about at least one axis.~~

~~50. The optical system of claim 44 wherein each channel micromirror is pivotable about at least one axis.~~

~~51. The optical system of claim 44 wherein each channel micromirror is a silicon micromachined mirror.~~

~~52. The optical system of claim 44 wherein said beam-focuser comprises a focusing lens having first and second focal points, and wherein said wavelength-separator and said channel micromirrors are placed respectively at said first and second focal points.~~

~~53. The optical system of claim 44 wherein said wavelength-separator comprises an element selected from the group consisting of ruled diffraction gratings, holographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing prisms.~~

~~54. The optical system of claim 44 further comprising a quarter-wave plate optically interposed between said wavelength-separator and said channel micromirrors.~~

~~55. The optical system of claim 44 further comprising an auxiliary wavelength-separating-routing apparatus, including:~~

~~a) multiple auxiliary fiber collimators, providing a plurality of auxiliary input ports and an exiting port;~~

~~b) an auxiliary wavelength-separator;~~

~~c) an auxiliary beam-focuser; and~~

~~d) a spatial array of auxiliary channel micromirrors;~~

~~wherein said subset of said spectral channels in said pass-through port and one or more add spectral channels are directed into said auxiliary input ports, and multiplexed into an output optical signal directed into said exiting port by way of said auxiliary wavelength-separator, said auxiliary beam-focuser and said auxiliary channel micromirrors.~~

~~56. The optical system of claim 55 wherein said auxiliary channel micromirrors are individually pivotable.~~

~~57. The optical system of claim 55 wherein each auxiliary channel micromirror is pivotable continuously about at least one axis.~~

~~58. The optical system of claim 55 wherein each auxiliary channel micromirror is a silicon micromachined mirror.~~

~~59. The optical system of claim 55 wherein said auxiliary wavelength-separator comprises an element selected from the group consisting of ruled diffraction gratings, holographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing prisms.~~

~~60. The optical system of claim 55 wherein said pass-through port constitutes one of said auxiliary input ports.~~

~~61. A method of performing dynamic wavelength separating and routing, comprising:~~

~~a) receiving a multi-wavelength optical signal from an input port;~~

~~b) separating said multi-wavelength optical signal into multiple spectral channels;~~

~~c) focusing said spectral channels onto a spatial array of corresponding beam-deflecting elements, whereby each beam-deflecting element receives one of said spectral channels; and~~

~~d) dynamically and continuously controlling said beam-deflecting elements[, thereby directing]~~ ~~*in two dimensions to direct*~~ ~~said spectral channels into [a plurality]~~ ~~*any selected*~~

~~*ones* of *said*~~ output ports ~~*and to control the power of the spectral channels coupled into said selected output ports.*~~

~~62. The method of claim 61 further comprising the step of providing feedback control of said beam-deflecting elements[, thereby maintaining] *to maintain* a predetermining coupling of each spectral channel directed into one of said output ports.~~

~~63. The method of claim 62 further comprising the step of maintaining power levels of said spectral channels directed into said output ports at a predetermining value.~~

~~64. The method of claim 61 wherein each spectral channel is directed into a separate output port.~~

~~65. The method of claim 61 wherein a subset of said spectral channels is directed into one of said output ports, thereby providing one or more pass-through spectral channels.~~

~~66. The method of claim 65 further comprising the step of multiplexing said pass-through spectral channels with one or more add spectral channels, so as to provide an output optical signal.~~

~~67. The method of claim 61 wherein said beam-deflecting elements comprise an array of silicon micromachined mirrors.~~

68. (New) A wavelength-separating-routing apparatus, comprising:

a) multiple fiber collimators, providing and serving as an input port for a multi-wavelength optical signal and a plurality of output ports;

b) a wavelength-separator, for separating said multi-wavelength optical signal from said fiber collimator input port into multiple spectral channels;

c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots; and

d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being pivotal about two axes and being individually and continuously controllable to reflect corresponding received spectral channels into any selected ones of said fiber collimator output ports and to control the power of said received spectral channels coupled into said fiber collimator output ports.

69. (New) The wavelength-separating-routing apparatus of claim 73 further comprising a servo-control assembly, in communication with said channel micromirrors and said fiber collimator output ports, for providing control of said channel micromirrors and thereby maintaining a predetermined coupling of each reflected spectral channel into one of said fiber collimator output ports.

70. (New) The wavelength-separating-routing apparatus of claim 74 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said fiber collimator output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors.

71. (New) The wavelength-separating-routing apparatus of claim 75 wherein said servo-control assembly maintains said power levels at a predetermined value.

72. (New) The wavelength-separating-routing apparatus of claim 73 further comprising an array of collimator-alignment mirrors, in optical communication with said wavelength-separator and said fiber collimators, for adjusting an alignment of said multi-wavelength optical signal from said fiber collimator input port and directing said reflected spectral channels into said fiber collimator output ports.

73. (New) The wavelength-separating-routing apparatus of claim 77 wherein each collimator-alignment mirror is rotatable about one axis.

74. (New) The wavelength-separating-routing apparatus of claim 77 wherein each collimator-alignment mirror is rotatable about two axes.

75. (New) The wavelength-separating-routing apparatus of claim 77 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimators.

76. (New) The wavelength-separating-routing apparatus of claim 73 wherein each channel micromirror is continuously pivotable about one axis.

77. (New) The wavelength-separating-routing apparatus of claim 73 wherein each channel micromirror is pivotable about two axes.

78. (New) The wavelength-separating-routing apparatus of claim 82 wherein said fiber collimators are arranged in a two-dimensional array.

79. (New) The wavelength-separating-routing apparatus of claim 73 wherein each channel micromirror is a silicon micromachined mirror.

80. (New) The wavelength-separating-routing apparatus of claim 73 wherein said fiber collimators are arranged in a one-dimensional array.

81. (New) The wavelength-separating-routing apparatus of claim 73 wherein said beam-focuser comprises a focusing lens having first and second focal points.

82. (New) The wavelength-separating-routing apparatus of claim 86 wherein said wavelength-separator and said channel micromirrors are placed respectively at said first and second focal points of said focusing lens.

83. (New) The wavelength-separating-routing apparatus of claim 73 wherein said beam-focuser comprises an assembly of lenses.

84. (New) The wavelength-separating-routing apparatus of claim 73 wherein said wavelength-separator comprises an element selected from the group consisting of ruled diffraction gratings, holographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing gratings.

85. (New) The wavelength-separating-routing apparatus of claim 73 further comprising a quarter-wave plate optically interposed between said wavelength-separator and said channel micromirrors.

86. (New) The wavelength-separating-routing apparatus of claim 73 wherein each fiber collimator output port carries a single one of said spectral channels.

87. (New) The wavelength-separating-routing apparatus of claim 91 further comprising one or more optical sensors, optically coupled to said fiber collimator output ports.

88. (New) A servo-based optical apparatus comprising:

a) multiple fiber collimators, providing an input port for a multi-wavelength optical signal and a plurality of output ports;

b) a wavelength-separator, for separating said multi-wavelength optical signal from said fiber collimator input port into multiple spectral channels;

c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots; and

d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being individually controllable to reflect said spectral channels into selected ones of said fiber collimator output ports; and

e) a servo-control assembly, in communication with said channel micromirrors and said fiber collimator output ports, for maintaining a predetermined coupling of each reflected spectral channel into one of said fiber collimator output ports.

89. (New) The servo-based optical apparatus of claim 93 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said fiber collimator output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors.

90. (New) The servo-based optical apparatus of claim 94 wherein said servo-control assembly maintains said power levels at a predetermined value.

91. (New) The servo-based optical apparatus of claim 93 further comprising an array of collimator-alignment mirrors, in optical communication with said wavelength-separator and said fiber collimators, for adjusting an alignment of said multi-wavelength optical signal from said fiber collimator input port and directing said reflected spectral channels into said fiber collimator output ports.

92. (New) The servo-based optical apparatus of claim 96 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimators.

93. (New) The servo-based optical apparatus of claim 96 wherein each collimator-alignment mirror is rotatable about at least one axis.

94. (New) The servo-based optical apparatus of claim 93 wherein each channel micromirror is continuously pivotable about at least one axis.

95. (New) The servo-based optical apparatus of claim 93 wherein each channel micromirror is a silicon micromachined mirror.

96. (New) The servo-based optical apparatus of claim 93 wherein said wavelength-separator comprises an element selected from the group consisting of ruled diffraction

gratings, holographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing prisms.

97. (New) The servo-based optical apparatus of claim 93 wherein said beam-focuser comprises one or more lenses.

98. (New) An optical apparatus comprising:

a) an array of fiber collimators, providing and serving as an input port for a multi-wavelength optical signal and a plurality of output ports;

b) a wavelength-separator, for separating said multi-wavelength optical signal from said fiber collimator input port into multiple spectral channels;

c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots;

d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being individually and continuously controllable to reflect said spectral channels into selected ones of said fiber collimator output ports; and

e) a one-dimensional array of collimator-alignment mirrors, for adjusting an alignment of said multi-wavelength optical signal from said fiber collimator input port and directing said reflected spectral channels into said fiber collimator output ports.

99. (New) The optical apparatus of claim 103 further comprising a servo-control assembly, in communication with said channel micromirrors, said collimator-alignment mirrors, and said fiber collimator output ports, for providing control of said channel micromirrors along with said collimator-alignment mirrors and thereby maintaining a predetermined coupling of each reflected spectral channel into one of said fiber collimator output ports.

100. (New) The optical apparatus of claim 104 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled

into said fiber collimator output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors and said collimator-alignment mirrors.

101. (New) The optical apparatus of claim 103 wherein each channel micromirror is continuously pivotable about at least one axis.

102. (New) The optical apparatus of claim 103 wherein each collimator-alignment mirror is rotatable about at least one axis.

103. (New) The optical apparatus of claim 103 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimators.

104. (New) An optical apparatus comprising:

a) an array of fiber collimators, providing and serving as an input port for a multi-wavelength optical signal and a plurality of output ports;

b) a wavelength-separator, for separating said multi-wavelength optical signal from said fiber collimator input port into multiple spectral channels;

c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots;

d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being individually and continuously controllable to reflect said spectral channels into selected ones of said fiber collimator output ports; and

e) a two-dimensional array of collimator-alignment mirrors, for adjusting an alignment of said multi-wavelength optical signal from said fiber collimator input port and directing said reflected spectral channels into said fiber collimator output ports.

105. (New) The optical apparatus of claim 109 further comprising a servo-control assembly, in communication with said channel micromirrors, and collimator-alignment mirrors, and said fiber collimator output ports, for providing control of said channel

micromirrors along with said collimator-alignment mirrors and thereby maintaining a predetermined coupling of each reflected spectral channel into one of said fiber collimator output ports.

106. (New) The optical apparatus of claim 110 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said fiber collimator output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors and said collimator-alignment mirrors.

107. (New) The optical apparatus of claim 109 wherein each collimator-alignment mirror is rotatable about at least one axis.

108. (New) The optical apparatus of claim 109 wherein each channel micromirror is continuously pivotable about at least one axis.

109. (New) The optical apparatus of claim 113 wherein each channel micromirrors is pivotable about two axes, and wherein said fiber collimators are arranged in a two-dimensional array.

110. (New) The optical apparatus of claim 109 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimators.

111. (New) An optical system comprising a wavelength-separating-routing apparatus, wherein said wavelength-separating-routing apparatus includes:

a) an array of fiber collimators, providing and serving as an input port for a multi-wavelength optical signal and a plurality of output ports including a pass-through port and one or more drop ports;

b) a wavelength-separator, for separating said multi-wavelength optical signal from said fiber collimator input port into multiple spectral channels;

c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots; and

d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being pivotal about two axes and being individually and continuously controllable to reflect corresponding received spectral channels into any selected ones of said fiber collimator output ports and to control the power of said received spectral channels coupled into said fiber collimator output ports, whereby said fiber collimator pass-through port receives a subset of said spectral channels.

112. (New) The optical system of claim 116 further comprising a servo-control assembly, in communication with said channel micromirrors and said fiber collimator output ports, for providing control of said channel micromirrors and thereby maintaining a predetermined coupling of each reflected spectral channel into one of said fiber collimator output ports.

113. (New) The optical system of claim 117 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said fiber collimator output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors.

114. (New) The optical system of claim 116 further comprising an array of collimator-alignment mirrors, in optical communication with said wavelength-separator and said fiber collimators, for adjusting an alignment of said multi-wavelength optical signal from said fiber collimator input port and directing said reflected spectral channels into said fiber collimator output ports.

115. (New) The optical system of claim 119 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimators.

116. (New) The optical system of claim 119 wherein each collimator-alignment mirror is rotatable about at least one axis.

117. (New) The optical system of claim 116 wherein each channel micromirror is pivotable about at least one axis.

118. (New) The optical system of claim 116 wherein each channel micromirror is a silicon micromachined mirror.

119. (New) The optical system of claim 116 wherein said beam-focuser comprises a focusing lens having first and second focal points, and wherein said wavelength-separator and said channel micromirrors are placed respectively at said first and second focal points.

120. (New) The optical system of claim 116 wherein said wavelength-separator comprises an element selected from the group consisting of ruled diffraction gratings, holographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing prisms.

121. (New) The optical system of claim 116 further comprising a quarter-wave plate optically interposed between said wavelength-separator and said channel micromirrors.

122. (New) The optical system of claim 116 further comprising an auxiliary wavelength-separating-routing apparatus, including:

a) multiple auxiliary fiber collimators, providing and serving as a plurality of auxiliary input ports and an exiting port;

b) an auxiliary wavelength-separator;

c) an auxiliary beam-focuser; and

d) a spatial array of auxiliary channel micromirrors;

wherein said subset of said spectral channels in said fiber collimator pass-through port and one or more add spectral channels are directed into said fiber collimator auxiliary input ports, and multiplexed into an output optical signal directed into said fiber collimator exiting

port by way of said auxiliary wavelength-separator, said auxiliary beam-focuser and said auxiliary channel micromirrors.

123. (New) The optical system of claim 122 wherein said auxiliary channel micromirrors are individually pivotable.

124. (New) The optical system of claim 122 wherein each auxiliary channel micromirror is pivotable continuously about at least one axis.

125. (New) The optical system of claim 122 wherein each auxiliary channel micromirror is a silicon micromachined mirror.

126. (New) The optical system of claim 122 wherein said auxiliary wavelength-separator comprises an element selected from the group consisting of ruled diffraction gratings, holographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing prisms.

127. (New) The optical system of claim 127 wherein said fiber collimator pass-through port constitutes one of said fiber collimator auxiliary input ports.

128. (New) A method of performing dynamic wavelength separating and routing, comprising:

a) receiving a multi-wavelength optical signal from a fiber collimator input port;

b) separating said multi-wavelength optical signal into multiple spectral channels;

c) focusing said spectral channels onto a spatial array of corresponding beam-deflecting elements, whereby each beam-deflecting element receives one of said spectral channels; and

d) dynamically and continuously controlling said beam-deflecting elements in two dimensions to direct said spectral channels into any selected ones of fiber collimator output ports and to control the power of the spectral channels coupled into said selected fiber collimator output ports.

129. (New) The method of claim 133 further comprising the step of providing feedback control of said beam-deflecting elements to maintain a predetermining coupling of each spectral channel directed into one of said fiber collimator output ports.

130. (New) The method of claim 134 further comprising the step of maintaining power levels of said spectral channels directed into said fiber collimator output ports at a predetermining value.

131. (New) The method of claim 133 wherein each spectral channel is directed into a separate fiber collimator output port.

132. (New) The method of claim 133 wherein a subset of said spectral channels is directed into one of said fiber collimator output ports, thereby providing one or more pass-through spectral channels.

133. (New) The method of claim 137 further comprising the step of multiplexing said pass-through spectral channels with one or more add spectral channels, so as to provide an output optical signal.

134. (New) The method of claim 133 wherein said beam-deflecting elements comprise an array of silicon micromachined mirrors.

135. (New) The wavelength-separating-routing apparatus of claim 73, wherein neither said multi-wavelength optical signal nor said spectral channels are transmitted through a circulator.

136. (New) The servo-based optical apparatus of claim 93, wherein neither said multi-wavelength optical signal nor said spectral channels are transmitted through a circulator.

137. (New) The optical apparatus of claim 103, wherein neither said multi-wavelength optical signal nor said spectral channels are transmitted through a circulator.

138. (New) The optical apparatus of claim 109, wherein neither said multi-wavelength optical signal nor said spectral channels are transmitted through a circulator.

139. (New) The optical system of claim 116, wherein neither said multi-wavelength optical signal nor said spectral channels are transmitted through a circulator.

Remarks

Statement of Substance of Interview

Applicant appreciates QAS Stein's discussion on Feb. 15, 22 and 25, 2019 regarding formalities related to this Preliminary Amendment. In accordance with QAS Stein's guidance, the above amendments are understood to formally comply with reissue amendment practice (e.g., under MPEP § 1453).

Status of the Claims and Support for Added Claims Under 37 C.F.R. § 1.173(c)

A first Preliminary Amendment was filed on June 29, 2018. As described below, the PTAB issued a certificate on Dec. 10, 2018 cancelling claims 1-4, 9, 10, 13, 17, 19-23, 27, 29, 44-46, 53 and 61-65. In view of the PTAB's certificate, this second Preliminary Amendment supersedes the first Preliminary Amendment, which to date has not been entered. Upon entry of the foregoing amendment, claims 68-139 are pending in the application, where claims 68, 88, 98, 104, 111, and 128 are the independent claims. A listing of claims including markup relative to the related claims of the reissue '678 patent is set forth in the Appendix. The added claims are believed to introduce no new matter, and their entry is respectfully requested.

Specific support for all new claims is listed below. However, support for each of these new claims can be found throughout the originally-filed application, which issued as U.S. Patent No. 6,625,346 to Wilde *et al.*

New	Exemplary Support[1]	Related RE'678 Claim
68, 111, and 128	3:54-57, 4:7-14, 4:26-27, 5:20-22, 6:54-60, 7:6-11, 11:26-30, 12:45-48, 13:1-12	1, 44, and 61
69, 99, 105, and 112	4:30-44, 11:5-57	2, 32, 38, and 45
70, 89, 100, 106, and 113	11:5-57	3, 22, 33, 39, and 46
72, 86, and 91	9:34-58	5, 19, and 24
84	4:15-20	17
87	11:65-67, 12:29-36	20
88	3:54-57, 4:7-14, 4:26-44, 5:20-22, 6:54-60, 7:6-11, 11:5-57, 12:45-48, 13:1-12	21

[1] Citations are to RE42,678 as published.

New	Exemplary Support[1]	Related RE'678 Claim
98 and 104	3:54-57, 4:7-14, 4:26-27, 5:20-22, 6:54-60, 7:6-11, 9:34-58, 11:26-30, 12:45-48, 13:1-12	31 and 37
114	9:34-58, 11:26-30	47
122	3:54-57, 4:26-27, 5:20-22, 6:54-60, 7:6-11, 11:26-30, 12:45-48, 13:1-12, 13:33-39	55
127	3:54-57, 4:26-27, 5:20-22, 6:54-60, 7:6-11, 11:26-30, 12:45-48, 13:1-12, 13:30-33	60
129	11:21-26	62
130	11:30-34	63
132	3:54-57, 4:26-27, 5:20-22, 6:54-60, 12:45-48, 13:1-12	65
135-139	3:6-9	

Status of Co-Pending Proceedings under 37 C.F.R. § 1.178(b)

This is a reissue application of U.S. Reissue Patent No. RE42,678, which is a reissue of U.S. Reissue Patent No. RE39,397, which is a reissue of U.S. Patent No. 6,625,346.[2]

RE42,678 is related to U.S. Reissue Patent No. RE42,368. A reissue application (U.S. Appl. No. 16/023,127) has been filed for RE42,368.

The PTAB issued Final Written Decisions in the following *inter partes* reviews filed against certain claims of RE42,678 and RE42,368. Applicant appealed all the PTAB's decisions to the Court of Appeals for the Federal Circuit. *See Capella Photonics, Inc. v. Cisco Sys., Inc.* (June 23, 2017) (Nos. 2016-2394, -2395, 2017-1105, -1106, -1107, -1108). All the appeals were consolidated into a single appeal, the Court affirmed the PTAB, and the Court denied Capella's rehearing request. On Nov. 5, 2018, the Supreme Court denied a petition for cert. On Dec. 10, 2018, The PTAB issued its certificate cancelling the claims at issue.

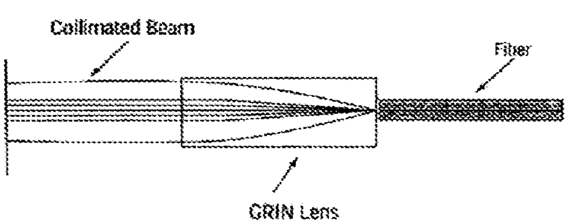
Inter Parts Review Proceedings	Status
IPR2014-01276 (RE42,678)	Petition for Cert denied, Federal Circuit mandate issued, PTAB certificate cancelling all challenged claims issued.
IPR2015-00726 (RE42,368)	
IPR2015-00727 (RE42,678)	
IPR2015-00731 (RE42,368)	
IPR2015-00739 (RE42,678)	
IPR2015-00816 (RE42,368)—merged with IPR2014-01166.	
IPR2015-00894 (RE42,678)—merged with IPR2014-01276.	

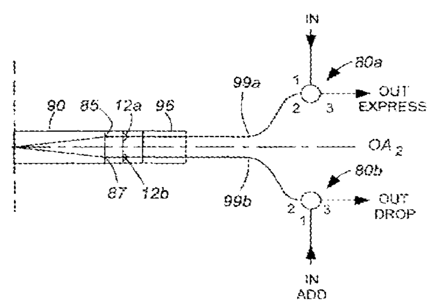
[2] RE39,397 did not include any claim amendments.

IPR2015-01958 (RE42,368)—merged with IPR2015-00726.	
IPR2015-01961 (RE42,678)—merged with IPR2015-00727.	
IPR2015-01969 (RE42,368)—merged with IPR2015-00731.	
IPR2015-01971 (RE42,678)—merged with IPR2015-00739.	

Proper Claim Construction of "Port"

In its Final Written Decisions, the PTAB alleged that U.S. Patent No. 6,498,872 to Bouevitch et al. ("Bouevitch") taught "ports" as claimed in RE42,678 because the PTAB alleged RE42,678 did not disavow circulator ports or define "port" to have a specific meaning. *See, e.g.*, IPR2014-01276, Final Written Decision, Paper 40 at 14-16 (PTAB Feb. 17, 2016). As shown below, the IN, OUT EXPRESS, OUT/DROP, and IN/ADD in Bouevitch are circulator ports. The claimed ports should not be construed to encompass circulator ports, such as the circulator ports in Bouevitch, for at least three reasons.

<table>
<tr><th>RE42,678 Collimator Ports</th><th>Bouevitch Circulator Ports</th></tr>
<tr><td>

See Specification, FIG. 1D; see also id. at 8:41-43 ("Each output port is provided by a quarter-pitch GRIN lens . . . coupled to an optical fiber (see FIG. 1D).").</td>
<td>

See Bouevitch, FIG. 11 (showing GRIN lens 90 and circulators 80a and 80b coupled to waveguides 99a and 99b).</td></tr>
</table>

1. The Term "Port in View of the Specification

The '678 Patent unambiguously uses collimator ports, not circulator ports.

The '678 Patent generally discusses two classes of ports: input ports and output ports. Input ports include add ports and pass-through ports. *See, e.g.*, Specification, 13:31-33 ("the pass-through port 630 and the add ports 660-1 through 660-M constitute the input ports"). Output ports include drop ports and also pass-through ports. *See, e.g.*, Specification, 5:20-22 ("The output ports of the first WSR-S (or WSR) apparatus include a pass-through port and one or more drop ports."), 12:46-48 ("a plurality of output ports, including a pass-through port 530 and one or more drop ports 540-1 through 540-N (N ≥1)").

The specification of the '678 Patent defines ports in the "Summary of the Invention" to be fiber collimators that serve as both the input ports and the output ports. According to the very first sentence in the Summary of the Invention, "***[t]he present invention*** . . . employ[s] an array of fiber collimators serving as an input port and a plurality of output ports." Specification, 3:54-57 (emphasis added). The appearance of this definition "in the 'Summary of the Invention' section makes it 'more likely' a description of the invention as a whole." *Sevenson Envtl. Servs., Inc. v. United States*, 76 Fed. Cl. 51, 69 (Fed. Cl. 2007) (citing *C.R. Bard, Inc. v. U.S. Surgical Corp.*, 388 F.3d 858, 864 (Fed. Cir. 2004)). The fact that the very first sentence of the Summary of the Invention expressly provides that fiber collimators are the physical structure of ports is compelling evidence that the claimed ports must be fiber collimators. *See C.R. Bard*, 388 F.3d at 864 (finding that when the Summary of the Invention states that "[t]he implant includes a pleated surface," the "patent requires the 'implant' . . . to have a pleated surface." (citation omitted)).

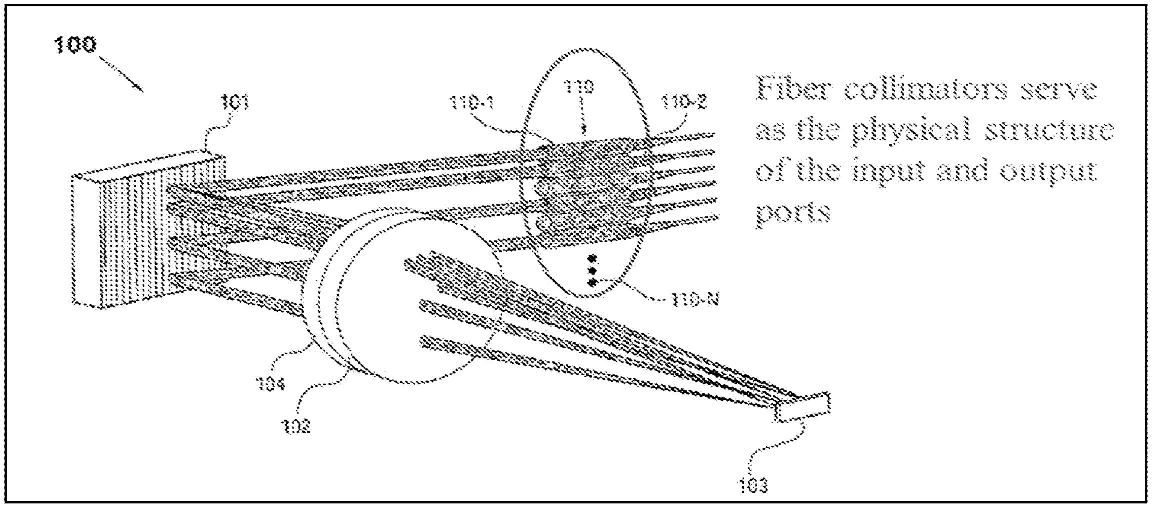
Additionally, because the physical structure provided for "port" in the Summary of the Invention is consistent with the characterization of port in the specification as a whole, "it is apparent that the patentee was not merely providing examples of the invention, but rather that the patentee intended for" the term port to have a fiber collimator physical structure. *See Sevenson Envtl. Servs.*, 76 Fed. Cl. at 69. "[The Federal Circuit] has indicated that a statement in a specification that describes the invention as a whole can support a limiting construction of a claim term. That is especially true where, as here, other statements and illustrations in the patent are consistent with the limiting description." *Am. Piledriving*

Equip., Inc. v. Geoquip, Inc., 637 F.3d 1324, 1334 (Fed. Cir. 2011) (citing *C.R. Bard*, 388 F.3d at 864).

The specification as a whole leaves no ambiguity: fiber collimators serve as the physical structure of the claimed ports. The specification repeatedly makes this relationship clear. *See, e.g.*, Specification, 4:26-27 ("The fiber collimators serving as the input and output ports"), 8:35-36 ("the fiber collimator serving as the output port"), 9:20-21 ("The fiber collimators serving as the input and output ports"), 9:62-63 ("the fiber collimators (serving as the input and output ports)"), 10:29-32 (In FIG. 3, "the one-dimensional fiber collimator array 110 of FIG. 2B is replaced by a two-dimensional array 350 of fiber collimators, providing for an input-port and a plurality of output ports."), 10:52-53 ("the fiber collimators that provide for the input and output ports"), 2:44 ("port/fiber"), 8:33-34 (output ports have a "fiber core"). Thus, "[t]he specification's use of the word ['port'] leaves no doubt about its meaning." *See PPC Broadband, Inc. v. Corning Optical Commc'ns RF, LLC*, 815 F.3d 747, 753 (Fed. Cir. 2016).

Similarly, this characterization of "port" as a "fiber collimator" is reinforced by the description of the patent's figures. The specification explains that Figure 1A, which is also printed on the face of the '678 Patent, depicts an apparatus that includes "an array of fiber collimators 110, providing an input port 110-1 and a plurality of output ports 110-2 through 110-N (N≥3)." ('678 Patent, 6:58-60.) In discussing 110-1 through 110-N, the specification uses the term "port" and its "fiber collimator" structure interchangeably. *See, e.g.*, Specification, 6:65 ("input port 110-1"), 7:9-10 ("output ports 110-2 through 110-N"), 8:19-20 ("output ports 110-2 through 110-N"), 10:14 ("fiber collimators 110-1 through 110-N"), 10:21 ("fiber collimators 110-1 through 110-N").[3] Thus, both the description of the figure and the description of the figure's components (110, 110-1 through 110-N) delineate the physical structure of "port" as a fiber collimator. An annotated version of Figure 1A is reproduced below.

[3] Figures 2A and 2B also use the 110 and 110-1 through 110-N nomenclature.



<u>*2. Negative Limitations*</u>

The claimed ports exclude circulator ports because the new claims in this application narrowly define the term "port." Several new claims recite a negative limitation. Claims 135-139 recite "wherein neither said multi-wavelength optical signal nor said spectral channels are transmitted through a circulator." These claim elements must be given patentable weight because all words in a claim must be considered—including negative limitations. *See In re Wilson*, 424 F.2d 1382, 1385 (C.C.P.A. 1970) ("All words in a claim must be considered in judging the patentability of that claim against the prior art."); *Ex parte Waghray*, Appeal No. 2011-007825, Appl. No. 11/433,547 (B.P.A.I., Sept. 18, 2012); *Ex parte Gilbert*, Appeal No. 2000-001741, Appl. No. 08/654,401 ("Albeit a negative limitation, this is still a claim limitation which must be considered by the examiner when evaluating the prior art which is applied against the claims.") (B.P.A.I., Jul. 31, 2002); *Ex Parte Deen*, Appeal No. 2008-001005, Appl. No. 11/175,231, p. 7 (B.P.A.I., Nov. 26, 2008) ("that when a reference fails to teach a negative limitation, such limitation cannot be assumed to be inherent to that reference simply by virtue of its negative nature."). Several new claims recite a negative limitation excluding circulators, so these claims exclude circulator ports.

3. Manifest Statement of Disavowal

The claimed ports exclude circulator ports because the patent owner unequivocally makes the following manifest statement of disavowal: The meaning of input port, output port, add port, drop port, and other ports in this reissue application does **not** encompass a "circulator port."[4] In the instance of disavowal, the prosecution history can compel departure from the plain meaning of a claim term. *Pacing Techs., LLC v. Garmin Int'l, Inc.*, 778 F.3d 1021, 1024 (Fed. Cir. 2015) (citation omitted). With this manifest statement of disavowal, Applicant has distinguished the ports in both the existing claims and the new claims—added herein or in future amendments—from circulator ports.

* * *

For at least these three reasons, the claimed "ports" have been differentiated from circulator ports, such as the circulator ports disclosed in Bouevitch.

U.S. Patent No. 6,798,941 to Smith et al. is Not Prior Art

In its Final Written Decisions, the PTAB alleged that U.S. Patent No. 6,798,941 to Smith et al. ("Smith") was prior art. *See, e.g.*, IPR2014-01276, Final Written Decision, Paper 40 at 20-25 (PTAB Feb. 17, 2016). Applicant respectfully disagrees even though the Federal Circuit affirmed the PTAB.

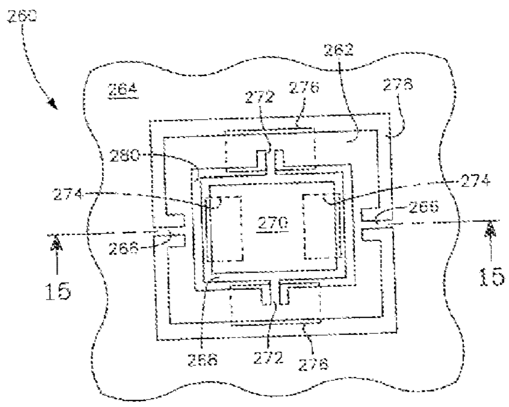
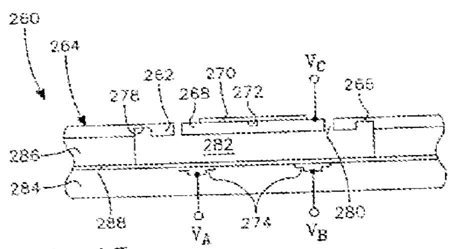
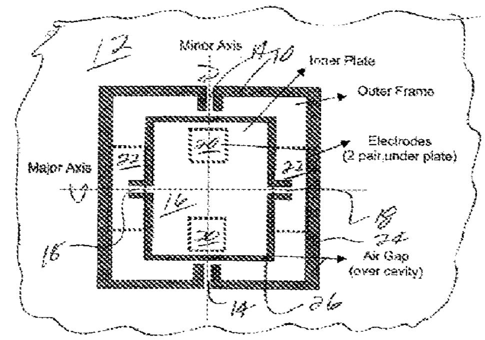
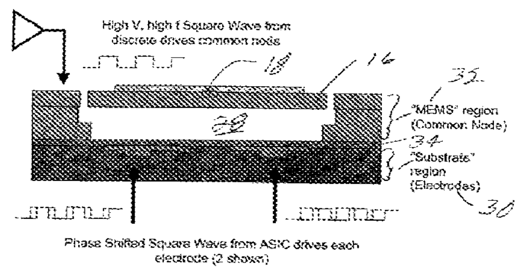
For Smith to be prior art, the effective filing date from one of the two following provisional applications must be relied upon: (1) U.S. Provisional Application No. 60/267,285 ("'285 Provisional") and (2) U.S. Provisional Application No. 60/234,683 ("'683 Provisional"). *Compare* Smith (filed September 20, 2001), *with* RE42,678 (priority back to

[4] A circulator could be coupled to (either upstream or downstream from) a claimed port. *See* U.S. Application No. 60/277,217, Specification at p. 3 ("Circulators are situated on all of the physical input/output ports, allowing for two-way optical propagation."), Drawings at FIG. 9; *see also* IPR2014-01276, Final Written Decision, Paper 44 at 16 (PTAB Feb. 17, 2016) (citing to disclosure in U.S. Application No. 60/277,217 for written support). But the claimed ports are unequivocally not circulator ports.

March 19, 2001). Neither the '285 Provisional nor the '683 Provisional can be relied upon for an earlier effective filing date.

Smith is not entitled to benefit from the filing date of the '285 Provisional because Smith and the '285 Provisional do not share common inventorship. A non-provisional patent application can only claim priority to a provisional application with common inventorship. *See* 35 U.S.C. §§ 119, 120; *see also* M.P.E.P. § 211. Here, the inventive entities are entirely different. *Compare* Smith (inventors David A. Smith, John E. Golub, and Fariborz Farhan), *with* '285 Provisional (inventors Steven L. Garverick and Michael L. Nagy). Smith is therefore not entitled to benefit from the filing date of the '285 Provisional.

Smith is also not entitled to benefit from the filing date of the '683 Provisional. Smith is not entitled to benefit from this filing date because the movable mirror disclosed in the '683 Provisional was not carried forward into the Smith patent. The law has held for at least thirty-four years that a patent is prior art as of its earliest effective filing date only for subject matter carried forward from the earliest application. *See In re Lund*, 376 F.2d 982, 988 (C.C.P.A. 1967) ("the continuation-in-part application is entitled to the filing date of the parent application as to all subject matter carried forward into it from the parent application, whether for purposes of obtaining a patent or subsequently utilizing the patent disclosure as evidence to defeat another's right to a patent."). The Federal Circuit has extended this principle to patents claiming priority to provisional applications. *See In re Giacomini*, 612 F.3d 1380, 1383-84 (Fed. Cir. 2010); *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1381 (Fed. Cir. 2015) (citing *In re Wertheim*, 646 F.2d 527, 537 (C.C.P.A. 1981)). Here, Smith's mirror structure is not entitled to the priority date of the '683 Provisional because the mirror disclosed in Smith was not carried forward from the '683 Provisional. Rather, the mirror structure was carried forward from the '285 Provisional, which Smith cannot claim benefit. As shown below, Smith's mirror is from the '285 Provisional—not the '683 Provisional.

Smith, FIGS. 14 and 15	**'285 Provisional, FIGS. 1 and 2**
 FIG. 14  FIG. 15	 Figure 1. Top view of electrostatic actuator with two axes and four driving electrodes.  Figure 2. Cross Sectional representation of symmetrical MEMS actuator showing common node and electrode arrangement.

Smith, 14:57-65	**'285 Provisional**
The cell includes a gimbal structure of an outer frame 262 twistably supported in a support structure 264 of the MEMS array through a first pair of torsion beams 266 extending along and twisting about a minor axis. The cell further includes a mirror plate 268 having a reflective surface 270 twistably supported on the outer frame 262 through a second pair of torsion beams 272 arranged along a major axis perpendicular to the minor axis and twisting thereabout.	It includes a gimbal structure of an outer frame 10 twistably supported in the support structure 12 of the MEMS array through a first pair of torsion bars 14 extending along and twisting about a minor axis and a mirror plate 16 having a reflective surface twistably supported by the outer frame 10 through a second pair of torsion bars 18 arranged along a major axis perpendicular to the minor axis and twisting thereabout.

The '683 Provisional vaguely discloses a mirror, but this disclosure was left behind; it was not carried forward into the Smith patent. The '683 Provisional discloses "a mirror array with elements that can be rotated in an analog fashion about two orthogonal axes." '683 Provisional, p. 6. This disclosure, however, is entirely different than the disclosure that ended up in the Smith patent. The mirrors are different because the '683 Provisional has mirrors that can be rotated in an analog fashion whereas Smith's mirror moves in a step-wise digital fashion. *See* IPR2014-01276, Final Written Decision, Paper 40 at 31 (PTAB Feb. 17, 2016) ("Petitioner does not dispute that Smith relies on digital control."). The Smith patent never talks about a mirror rotated in an analog fashion. Rather, this disclosure was left behind. Since Smith cannot rely on the provisional application where Smith's mirror originated (i.e., the '285 Provisional), Smith is not entitled to an earlier effective filing date, at least with respect to a two-axis mirror.

* * *

Smith is not entitled to the filing date of the '285 Provisional because Smith and the '285 Provisional do not share common inventorship. And Smith is not entitled to the filing date of the '683 Provisional because Smith's mirror structure was not carried forward from the '683 Provisional. Since Smith is not entitled to an earlier effective filing date, the Office should not rely on Smith as a prior art reference.

Conclusion

Prompt and favorable consideration of this Preliminary Amendment is respectfully requested. Applicant believes the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

/Jason D. Eisenberg/

Robert Greene Sterne, Reg. No. 28,912
Jason D. Eisenberg, Reg. No. 43,447
Sean C. Flood, Reg. No. 64,378
Tyler J. Dutton, Reg. No. 75,069
Attorneys for Patent Owner

Date: March 25, 2019

1100 New York Avenue, N.W.
Washington, D.C. 20005-3934
(202) 371-2600

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APPENDIX

Listing of claims including markup relative to claims 1-67 of the Reissue Patent No. 42,678:

68. A wavelength-separating-routing apparatus, comprising:

a) multiple fiber collimators, providing and serving as an input port for a multi-wavelength optical signal and a plurality of output ports;

b) a wavelength-separator, for separating said multi-wavelength optical signal from said fiber collimator input port into multiple spectral channels;

c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots; and

d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being pivotal about two axes and being individually and continuously controllable to reflect ~~said~~ corresponding received spectral channels into any selected ones of said fiber collimator output ports and to control the power of said received spectral channels coupled into said fiber collimator output ports.

69. The wavelength-separating-routing apparatus of claim 73 further comprising a servo-control assembly, in communication with said channel micromirrors and said fiber collimator output ports, for providing control of said channel micromirrors and thereby maintaining a predetermined coupling of each reflected spectral channel into one of said fiber collimator output ports.

70. The wavelength-separating-routing apparatus of claim 74 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said fiber collimator output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors.

71. The wavelength-separating-routing apparatus of claim 75 wherein said servo-control assembly maintains said power levels at a predetermined value.

72. The wavelength-separating-routing apparatus of claim 73 further comprising an array of collimator-alignment mirrors, in optical communication with said wavelength-

separator and said fiber collimators, for adjusting an alignment of said multi-wavelength optical signal from said <u>fiber collimator</u> input port and directing said reflected spectral channels into said <u>fiber collimator</u> output ports.

73. The wavelength-separating-routing apparatus of claim 77 wherein each collimator-alignment mirror is rotatable about one axis.

74. The wavelength-separating-routing apparatus of claim 77 wherein each collimator-alignment mirror is rotatable about two axes.

75. The wavelength-separating-routing apparatus of claim 77 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimators.

76. The wavelength-separating-routing apparatus of claim 73 wherein each channel micromirror is continuously pivotable about one axis.

77. The wavelength-separating-routing apparatus of claim 73 wherein each channel micromirror is pivotable about two axes.

78. The wavelength-separating-routing apparatus of claim 82 wherein said fiber collimators are arranged in a two-dimensional array.

79. The wavelength-separating-routing apparatus of claim 73 wherein each channel micromirror is a silicon micromachined mirror.

80. The wavelength-separating-routing apparatus of claim 73 wherein said fiber collimators are arranged in a one-dimensional array.

81. The wavelength-separating-routing apparatus of claim 73 wherein said beam-focuser comprises a focusing lens having first and second focal points.

82. The wavelength-separating-routing apparatus of claim 86 wherein said wavelength-separator and said channel micromirrors are placed respectively at said first and second focal points of said focusing lens.

83. The wavelength-separating-routing apparatus of claim 73 wherein said beam-focuser comprises an assembly of lenses.

84. The wavelength-separating-routing apparatus of claim 73 wherein said wavelength-separator comprises an element selected from the group consisting of ruled diffraction gratings, ~~halographic~~ holographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing gratings.

85. The wavelength-separating-routing apparatus of claim 73 further comprising a quarter-wave plate optically interposed between said wavelength-separator and said channel micromirrors.

86. The wavelength-separating-routing apparatus of claim 73 wherein each fiber collimator output port carries a single one of said spectral channels.

87. The wavelength-separating-routing apparatus of claim 91 further comprising one or more optical sensors, optically coupled to said fiber collimator output ports.

88. A servo-based optical apparatus comprising:

a) multiple fiber collimators, providing an input port for a multi-wavelength optical signal and a plurality of output ports;

b) a wavelength-separator, for separating said multi-wavelength optical signal from said fiber collimator input port into multiple spectral channels;

c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots; and

d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being individually controllable to reflect said spectral channels into selected ones of said fiber collimator output ports; and

e) a servo-control assembly, in communication with said channel micromirrors and said fiber collimator output ports, for maintaining a predetermined coupling of each reflected spectral channel into one of said fiber collimator output ports.

89. The servo-based optical apparatus of claim 93 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said fiber collimator output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors.

90. The servo-based optical apparatus of claim 94 wherein said servo-control assembly maintains said power levels at a predetermined value.

91. The servo-based optical apparatus of claim 93 further comprising an array of collimator-alignment mirrors, in optical communication with said wavelength-separator and said fiber collimators, for adjusting an alignment of said multi-wavelength optical signal from said fiber collimator input port and directing said reflected spectral channels into said fiber collimator output ports.

92. The servo-based optical apparatus of claim 96 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimators.

93. The servo-based optical apparatus of claim 96 wherein each collimator-alignment mirror is rotatable about at least one axis.

94. The servo-based optical apparatus of claim 93 wherein each channel micromirror is continuously pivotable about at least one axis.

95. The servo-based optical apparatus of claim 93 wherein each channel micromirror is a silicon micromachined mirror.

96. The servo-based optical apparatus of claim 93 wherein said wavelength-separator comprises an element selected from the group consisting of ruled diffraction gratings, holographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing prisms.

97. The servo-based optical apparatus of claim 93 wherein said beam-focuser comprises one or more lenses.

98. An optical apparatus comprising:

a) an array of fiber collimators, providing and serving as an input port for a multi-wavelength optical signal and a plurality of output ports;

b) a wavelength-separator, for separating said multi-wavelength optical signal from said fiber collimator input port into multiple spectral channels;

c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots;

d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being individually and continuously controllable to reflect said spectral channels into selected ones of said fiber collimator output ports; and

e) a one-dimensional array of collimator-alignment mirrors, for adjusting an alignment of said multi-wavelength optical signal from said fiber collimator input port and directing said reflected spectral channels into said fiber collimator output ports.

99. The optical apparatus of claim 103 further comprising a servo-control assembly, in communication with said channel micromirrors, said collimator-alignment mirrors, and said fiber collimator output ports, for providing control of said channel micromirrors along

with said collimator-alignment mirrors and thereby maintaining a predetermined coupling of each reflected spectral channel into one of said <u>fiber collimator</u> output ports.

100. The optical apparatus of claim 104 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said <u>fiber collimator</u> output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors and said collimator-alignment mirrors.

101. The optical apparatus of claim 103 wherein each channel micromirror is continuously pivotable about at least one axis.

102. The optical apparatus of claim 103 wherein each collimator-alignment mirror is rotatable about at least one axis.

103. The optical apparatus of claim 103 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimators.

104. An optical apparatus comprising:

a) an array of fiber collimators, providing <u>and serving as</u> an input port for a multi-wavelength optical signal and a plurality of output ports;

b) a wavelength-separator, for separating said multi-wavelength optical signal from said <u>fiber collimator</u> input port into multiple spectral channels;

c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots;

d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being individually and continuously controllable to reflect said spectral channels into selected ones of said <u>fiber collimator</u> output ports; and

e) a two-dimensional array of collimator-alignment mirrors, for adjusting an alignment of said multi-wavelength optical signal from said fiber collimator input port and directing said reflected spectral channels into said fiber collimator output ports.

105. The optical apparatus of claim 109 further comprising a servo-control assembly, in communication with said channel micromirrors, and collimator-alignment mirrors, and said fiber collimator output ports, for providing control of said channel micromirrors along with said collimator-alignment mirrors and thereby maintaining a predetermined coupling of each reflected spectral channel into one of said fiber collimator output ports.

106. The optical apparatus of claim 110 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said fiber collimator output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors and said collimator-alignment mirrors.

107. The optical apparatus of claim 109 wherein each collimator-alignment mirror is rotatable about at least one axis.

108. The optical apparatus of claim 109 wherein each channel micromirror is continuously pivotable about at least one axis.

109. The optical apparatus of claim 113 wherein each channel micromirrors is pivotable about two axes, and wherein said fiber collimators are arranged in a two-dimensional array.

110. The optical apparatus of claim 109 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimators.

111. An optical system comprising a wavelength-separating-routing apparatus, wherein said wavelength-separating-routing apparatus includes:

a) an array of fiber collimators, providing <u>and serving as</u> an input port for a multi-wavelength optical signal and a plurality of output ports including a pass-through port and one or more drop ports;

b) a wavelength-separator, for separating said multi-wavelength optical signal from said <u>fiber collimator</u> input port into multiple spectral channels;

c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots; and

d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being pivotal about two axes and being individually and continuously controllable to reflect corresponding received spectral channels into any selected ones of said <u>fiber collimator</u> output ports and to control the power of said received spectral channels coupled into said <u>fiber collimator</u> output ports, whereby said <u>fiber collimator</u> pass-through port receives a subset of said spectral channels.

112. The optical system of claim 116 further comprising a servo-control assembly, in communication with said channel micromirrors and said <u>fiber collimator</u> output ports, for providing control of said channel micromirrors and thereby maintaining a predetermined coupling of each reflected spectral channel into one of said <u>fiber collimator</u> output ports.

113. The optical system of claim 117 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said <u>fiber collimator</u> output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors.

114. The optical system of claim 116 further comprising an array of collimator-alignment mirrors, in optical communication with said wavelength-separator and said fiber collimators, for adjusting an alignment of said multi-wavelength optical signal from said <u>fiber collimator</u> input port and directing said reflected spectral channels into said <u>fiber collimator</u> output ports.

115. The optical system of claim 119 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimators.

116. The optical system of claim 119 wherein each collimator-alignment mirror is rotatable about at least one axis.

117. The optical system of claim 116 wherein each channel micromirror is pivotable about at least one axis.

118. The optical system of claim 116 wherein each channel micromirror is a silicon micromachined mirror.

119. The optical system of claim 116 wherein said beam-focuser comprises a focusing lens having first and second focal points, and wherein said wavelength-separator and said channel micromirrors are placed respectively at said first and second focal points.

120. The optical system of claim 116 wherein said wavelength-separator comprises an element selected from the group consisting of ruled diffraction gratings, holographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing prisms.

121. The optical system of claim 116 further comprising a quarter-wave plate optically interposed between said wavelength-separator and said channel micromirrors.

122. The optical system of claim 116 further comprising an auxiliary wavelength-separating-routing apparatus, including:

a) multiple auxiliary fiber collimators, providing <u>and serving as</u> a plurality of auxiliary input ports and an exiting port;

b) an auxiliary wavelength-separator;

c) an auxiliary beam-focuser; and

d) a spatial array of auxiliary channel micromirrors;

wherein said subset of said spectral channels in said <u>fiber collimator</u> pass-through port and one or more add spectral channels are directed into said <u>fiber collimator</u> auxiliary input ports, and multiplexed into an output optical signal directed into said <u>fiber collimator</u> exiting port by way of said auxiliary wavelength-separator, said auxiliary beam-focuser and said auxiliary channel micromirrors.

123. The optical system of claim 122 wherein said auxiliary channel micromirrors are individually pivotable.

124. The optical system of claim 122 wherein each auxiliary channel micromirror is pivotable continuously about at least one axis.

125. The optical system of claim 122 wherein each auxiliary channel micromirror is a silicon micromachined mirror.

126. The optical system of claim 127 wherein said auxiliary wavelength-separator comprises an element selected from the group consisting of ruled diffraction gratings, holographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing prisms.

127. The optical system of claim 122 wherein said <u>fiber collimator</u> pass-through port constitutes one of said <u>fiber collimator</u> auxiliary input ports.

128. A method of performing dynamic wavelength separating and routing, comprising:

a) receiving a multi-wavelength optical signal from a <u>fiber collimator</u> input port;

b) separating said multi-wavelength optical signal into multiple spectral channels;

c) focusing said spectral channels onto a spatial array of corresponding beam-deflecting elements, whereby each beam-deflecting element receives one of said spectral channels; and

d) dynamically and continuously controlling said beam-deflecting elements in two dimensions to direct said spectral channels into any selected ones of fiber collimator output ports and to control the power of the spectral channels coupled into said selected fiber collimator output ports.

129. The method of claim 133 further comprising the step of providing feedback control of said beam-deflecting elements to maintain a predetermining coupling of each spectral channel directed into one of said fiber collimator output ports.

130. The method of claim 134 further comprising the step of maintaining power levels of said spectral channels directed into said fiber collimator output ports at a predetermining value.

131. The method of claim 133 wherein each spectral channel is directed into a separate fiber collimator output port.

132. The method of claim 133 wherein a subset of said spectral channels is directed into one of said fiber collimator output ports, thereby providing one or more pass-through spectral channels.

133. The method of claim 137 further comprising the step of multiplexing said pass-through spectral channels with one or more add spectral channels, so as to provide an output optical signal.

134. The method of claim 133 wherein said beam-deflecting elements comprise an array of silicon micromachined mirrors.

135. The wavelength-separating-routing apparatus of claim 73, wherein neither said multi-wavelength optical signal nor said spectral channels are transmitted through a circulator.

136. The servo-based optical apparatus of claim 93, wherein neither said multi-wavelength optical signal nor said spectral channels are transmitted through a circulator.

137. The optical apparatus of claim 103, wherein neither said multi-wavelength optical signal nor said spectral channels are transmitted through a circulator.

138. The optical apparatus of claim 109, wherein neither said multi-wavelength optical signal nor said spectral channels are transmitted through a circulator.

139. The optical system of claim 116, wherein neither said multi-wavelength optical signal nor said spectral channels are transmitted through a circulator.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventors: WILDE *et al.*	Confirmation No.: 3621
Applicant: CAPELLA PHOTONICS, INC.	Art Unit: 3992
Reissue Application No.: 16/023,183	Examiner: HUGHES, DEANDRA M.
Filing Date: June 29, 2018	Atty. Docket: 3564.015REI0

Title: **Reconfigurable Optical Add-Drop Multiplexers with Servo Control and Dynamic Spectral Power Management Capabilities**

Amendment and Reply Under 37 C.F.R. § 1.116

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Mail Stop AF

Commissioner:

In reply to the Office Action dated September 5, 2019, Applicant submits the following Amendment and Remarks.

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this paper.

Remarks and Arguments begin on page 19 of this paper.

It is not believed that extensions of time are required beyond those that may otherwise be provided for in documents accompanying this paper. However, if additional extensions of time are necessary to prevent abandonment of this application, then such extensions of time are hereby petitioned under 37 C.F.R. § 1.136(a), and any additional fees required to continue prosecution or appeal of this application (including issue fee, fees for net addition of claims or forwarding to appeal) are hereby authorized to be charged to our Deposit Account No. 19-0036.

Amendments to the Claims

Please amend pending **claims 72, 75, 78, 80, 91, and 92**, as indicated below. **Claims 1-67** remain canceled. Applicant has also provided an informally annotated set of claims showing changes between the last filed Response and this Response in body of this Response. A complete listing of all claims and their status in the application is as follows:

~~1. A wavelength-separating-routing apparatus, comprising:~~

~~a) multiple fiber collimators, providing an input port for a multi-wavelength optical signal and a plurality of output ports;~~

~~b) a wavelength-separator, for separating said multi-wavelength optical signal from said input port into multiple spectral channels;~~

~~c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots; and~~

~~d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors~~ ~~*being pivotal about two axes and being*~~ ~~individually and continuously controllable to reflect [said]~~ ~~*corresponding received*~~ ~~spectral channels into any selected ones of said output ports~~ ~~*and to control the power of said received spectral channels coupled into said output ports*.~~

~~2. The wavelength-separating-routing apparatus of claim 1 further comprising a servo-control assembly, in communication with said channel micromirrors and said output ports, for providing control of said channel micromirrors and thereby maintaining a predetermined coupling of each reflected spectral channel into one of said output ports.~~

~~3. The wavelength-separating-routing apparatus of claim 2 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors.~~

~~4. The wavelength-separating-routing apparatus of claim 3 wherein said servo-control assembly maintains said power levels at a predetermined value.~~

5. (Canceled)

6. (Canceled)

7. (Canceled)

8. (Canceled)

~~9. The wavelength-separating-routing apparatus of claim 1 wherein each channel micromirror is continuously pivotable about one axis.~~

~~10. The wavelength-separating-routing apparatus of claim 1 wherein each channel micromirror is pivotable about two axes~~

11. (Canceled)

12. (Canceled)

~~13. The wavelength-separating-routing apparatus of claim 1 wherein said fiber collimators are arranged in a one-dimensional array.~~

14. (Canceled)

15. (Canceled)

16. (Canceled)

~~17. The wavelength-separating-routing apparatus of claim 1 wherein said wavelength-separator comprises an element selected from the group consisting of ruled diffraction gratings, halographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing gratings.~~

18. (Canceled)

~~19. The wavelength-separating-routing apparatus of claim 1 wherein each output port carries a single one of said spectral channels.~~

~~20. The wavelength-separating-routing apparatus of claim 19 further comprising one or more optical sensors, optically coupled to said output ports~~

~~21. A servo-based optical apparatus comprising:~~

~~a) multiple fiber collimators, providing an input port for a multi-wavelength optical signal and a plurality of output ports;~~

~~b) a wavelength-separator, for separating said multi-wavelength optical signal from said input port into multiple spectral channels;~~

~~c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots; and~~

~~d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being individually controllable to reflect said spectral channels into selected ones of said output ports; and~~

~~e) a servo-control assembly, in communication with said channel micromirrors and said output ports, for maintaining a predetermined coupling of each reflected spectral channel into one of said output ports.~~

~~22. The servo-based optical apparatus of claim 21 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors.~~

~~23. The servo-based optical apparatus of claim 22 wherein said servo-control assembly maintains said power levels at a predetermined value.~~

24. (Canceled)

25. (Canceled)

26. (Canceled)

~~27. The servo-based optical apparatus of claim 21 wherein each channel micromirror is continuously pivotable about at least one axis.~~

28. (Canceled)

~~29. The servo-based optical apparatus of claim 21 wherein said wavelength-separator comprises an element selected from the group consisting of ruled diffraction gratings, holographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing prisms.~~

30. (Canceled)

31. (Canceled)

32. (Canceled)

33. (Canceled)

34. (Canceled)

35. (Canceled)

36. (Canceled)

37. (Canceled)

38. (Canceled)

39. (Canceled)

40. (Canceled)

41. (Canceled)

42. (Canceled)

43. (Canceled)

~~44. An optical system comprising a wavelength-separating-routing apparatus, wherein said wavelength-separating-routing apparatus includes:~~

~~a) an array of fiber collimators, providing an input port for a multi-wavelength optical signal and a plurality of output ports including a pass-through port and one or more drop ports;~~

~~b) a wavelength-separator, for separating said multi-wavelength optical signal from said input port into multiple spectral channels;~~

~~c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots; and~~

~~d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being~~ ~~*pivotal about two axes and being*~~ ~~individually and continuously [pivotable]~~ ~~*controllable*~~ ~~to reflect [said]~~ ~~*corresponding received*~~ ~~spectral channels into~~ ~~*any*~~ ~~selected ones of said output ports~~ ~~*and to control the power of said received spectral channels coupled into said output ports*~~~~, whereby said pass-through port receives a subset of said spectral channels.~~

~~45. The optical system of claim 44 further comprising a servo-control assembly, in communication with said channel micromirrors and said output ports, for providing control of said channel micromirrors and thereby maintaining a predetermined coupling of each reflected spectral channel into one of said output ports.~~

~~46. The optical system of claim 45 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors.~~

47. (Canceled)

48. (Canceled)

49. (Canceled)

50. (Canceled)

51. (Canceled)

52. (Canceled)

~~53. The optical system of claim 44 wherein said wavelength-separator comprises an element selected from the group consisting of ruled diffraction gratings, holographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing prisms.~~

54. (Canceled)

55. (Canceled)

56. (Canceled)

~~57. The optical system of claim 55 wherein each auxiliary channel micromirror is pivotable continuously about at least one axis.~~

~~58. The optical system of claim 55 wherein each auxiliary channel micromirror is a silicon micromachined mirror.~~

~~59. The optical system of claim 55 wherein said auxiliary wavelength-separator comprises an element selected from the group consisting of ruled diffraction gratings, holographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing prisms.~~

~~60. The optical system of claim 55 wherein said pass-through port constitutes one of said auxiliary input ports.~~

~~61. A method of performing dynamic wavelength separating and routing, comprising:~~

~~a) receiving a multi-wavelength optical signal from an input port;~~

~~b) separating said multi-wavelength optical signal into multiple spectral channels;~~

~~c) focusing said spectral channels onto a spatial array of corresponding beam-deflecting elements, whereby each beam-deflecting element receives one of said spectral channels; and~~

~~d) dynamically and continuously controlling said beam-deflecting elements[, thereby directing]~~ ~~*in two dimensions to direct*~~ ~~said spectral channels into [a plurality]~~ ~~*any selected ones*~~ ~~of~~ ~~*said*~~ ~~output ports~~ ~~*and to control the power of the spectral channels coupled into said selected output ports*.~~

~~62. The method of claim 61 further comprising the step of providing feedback control of said beam-deflecting elements[, thereby maintaining]~~ ~~*to maintain*~~ ~~a predetermining coupling of each spectral channel directed into one of said output ports.~~

~~63. The method of claim 62 further comprising the step of maintaining power levels of said spectral channels directed into said output ports at a predetermining value.~~

~~64. The method of claim 61 wherein each spectral channel is directed into a separate output port.~~

~~65. The method of claim 61 wherein a subset of said spectral channels is directed into one of said output ports, thereby providing one or more pass-through spectral channels.~~

66. (Canceled)

67. (Canceled)

68. (New) A wavelength-separating-routing apparatus, comprising:

a) multiple fiber collimators, providing and serving as an input port for a multi-wavelength optical signal and a plurality of output ports;

b) a wavelength-separator, for separating said multi-wavelength optical signal from said fiber collimator input port into multiple spectral channels;

c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots; and

d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being pivotal about two axes and being individually and continuously controllable to reflect corresponding received spectral channels into any selected ones of said fiber collimator output ports and to control the power of said received spectral channels coupled into said fiber collimator output ports.

69. (New) The wavelength-separating-routing apparatus of claim 68 further comprising a servo-control assembly, in communication with said channel micromirrors and said fiber collimator output ports, for providing control of said channel micromirrors and thereby maintaining a predetermined coupling of each reflected spectral channel into one of said fiber collimator output ports.

70. (New) The wavelength-separating-routing apparatus of claim 69 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said fiber collimator output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors.

71. (New) The wavelength-separating-routing apparatus of claim 70 wherein said servo-control assembly maintains said power levels at a predetermined value.

72. (New, amended) The wavelength-separating-routing apparatus of claim 68 further comprising an array of collimator-alignment mirrors, in optical communication with said wavelength-separator and said fiber collimator input and output ports, for adjusting an alignment of said multi-wavelength optical signal from said fiber collimator input port and directing said reflected spectral channels into said fiber collimator output ports.

73. (New) The wavelength-separating-routing apparatus of claim 72 wherein each collimator-alignment mirror is rotatable about one axis.

74. (New) The wavelength-separating-routing apparatus of claim 72 wherein each collimator-alignment mirror is rotatable about two axes.

75. (New, amended) The wavelength-separating-routing apparatus of claim 72 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimator input and output ports.

76. (New) The wavelength-separating-routing apparatus of claim 68 wherein each channel micromirror is continuously pivotable about one axis.

77. (New) The wavelength-separating-routing apparatus of claim 68 wherein each channel micromirror is pivotable about two axes.

78. (New, amended) The wavelength-separating-routing apparatus of claim 77 wherein said fiber collimator input and output ports are arranged in a two-dimensional array.

79. (New) The wavelength-separating-routing apparatus of claim 68 wherein each channel micromirror is a silicon micromachined mirror.

80. (New, amended) The wavelength-separating-routing apparatus of claim 68 wherein said fiber collimator input and output ports are arranged in a one-dimensional array.

81. (New) The wavelength-separating-routing apparatus of claim 68 wherein said beam-focuser comprises a focusing lens having first and second focal points.

82. (New) The wavelength-separating-routing apparatus of claim 81 wherein said wavelength-separator and said channel micromirrors are placed respectively at said first and second focal points of said focusing lens.

83. (New) The wavelength-separating-routing apparatus of claim 68 wherein said beam-focuser comprises an assembly of lenses.

84. (New) The wavelength-separating-routing apparatus of claim 68 wherein said wavelength-separator comprises an element selected from the group consisting of ruled diffraction gratings, holographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing gratings.

85. (New) The wavelength-separating-routing apparatus of claim 68 further comprising a quarter-wave plate optically interposed between said wavelength-separator and said channel micromirrors.

86. (New) The wavelength-separating-routing apparatus of claim 68 wherein each fiber collimator output port carries a single one of said spectral channels.

87. (New) The wavelength-separating-routing apparatus of claim 86 further comprising one or more optical sensors, optically coupled to said fiber collimator output ports.

88. (New) A servo-based optical apparatus comprising:

a) multiple fiber collimators, providing an input port for a multi-wavelength optical signal and a plurality of output ports;

b) a wavelength-separator, for separating said multi-wavelength optical signal from said fiber collimator input port into multiple spectral channels;

c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots; and

d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being individually controllable to reflect said spectral channels into selected ones of said fiber collimator output ports; and

e) a servo-control assembly, in communication with said channel micromirrors and said fiber collimator output ports, for maintaining a predetermined coupling of each reflected spectral channel into one of said fiber collimator output ports.

89. (New) The servo-based optical apparatus of claim 88 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said fiber collimator output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors.

90. (New) The servo-based optical apparatus of claim 89 wherein said servo-control assembly maintains said power levels at a predetermined value.

91. (New, amended) The servo-based optical apparatus of claim 88 further comprising an array of collimator-alignment mirrors, in optical communication with said wavelength-separator and said fiber collimator input and output ports, for adjusting an alignment of said multi-wavelength optical signal from said fiber collimator input port and directing said reflected spectral channels into said fiber collimator output ports.

92. (New, amended) The servo-based optical apparatus of claim 91 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimator input and output ports.

93. (New) The servo-based optical apparatus of claim 91 wherein each collimator-alignment mirror is rotatable about at least one axis.

94. (New) The servo-based optical apparatus of claim 88 wherein each channel micromirror is continuously pivotable about at least one axis.

95. (New) The servo-based optical apparatus of claim 88 wherein each channel micromirror is a silicon micromachined mirror.

96. (New) The servo-based optical apparatus of claim 88 wherein said wavelength-separator comprises an element selected from the group consisting of ruled diffraction gratings, holographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing prisms.

97. (New) The servo-based optical apparatus of claim 88 wherein said beam-focuser comprises one or more lenses.

98. (New) An optical apparatus comprising:

a) an array of fiber collimators providing and serving as an input port for a multi-wavelength optical signal;

b) a plurality of output ports;

c) a wavelength-separator, for separating said multi-wavelength optical signal from said fiber collimator input port into multiple spectral channels;

d) a beam-focuser, for focusing said spectral channels into corresponding spectral spots;

e) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being individually and continuously controllable to reflect said spectral channels into selected ones of said output ports; and

f) a one-dimensional array of collimator-alignment mirrors, for adjusting an alignment of said multi-wavelength optical signal from said fiber collimator input port and directing said reflected spectral channels into said output ports.

99. (New) The optical apparatus of claim 98 further comprising a servo-control assembly, in communication with said channel micromirrors, said collimator-alignment mirrors, and said output ports, for providing control of said channel micromirrors along with said collimator-alignment mirrors and thereby maintaining a predetermined coupling of each reflected spectral channel into one of said output ports.

100. (New) The optical apparatus of claim 99 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said output

ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors and said collimator-alignment mirrors.

101. (New) The optical apparatus of claim 98 wherein each channel micromirror is continuously pivotable about at least one axis.

102. (New) The optical apparatus of claim 98 wherein each collimator-alignment mirror is rotatable about at least one axis.

103. (New) The optical apparatus of claim 98 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimators.

104. (New) An optical apparatus comprising:

a) an array of fiber collimators, providing and serving as an input port for a multi-wavelength optical signal;

b) a plurality of output ports;

c) a wavelength-separator, for separating said multi-wavelength optical signal from said fiber collimator input port into multiple spectral channels;

d) a beam-focuser, for focusing said spectral channels into corresponding spectral spots;

e) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being individually and continuously controllable to reflect said spectral channels into selected ones of said output ports; and

f) a two-dimensional array of collimator-alignment mirrors, for adjusting an alignment of said multi-wavelength optical signal from said fiber collimator input port and directing said reflected spectral channels into said output ports.

105. (New) The optical apparatus of claim 104 further comprising a servo-control assembly, in communication with said channel micromirrors, and collimator-alignment mirrors, and said output ports, for providing control of said channel micromirrors along with said collimator-alignment

mirrors and thereby maintaining a predetermined coupling of each reflected spectral channel into one of said output ports.

106. (New) The optical apparatus of claim 105 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors and said collimator-alignment mirrors.

107. (New) The optical apparatus of claim 104 wherein each collimator-alignment mirror is rotatable about at least one axis.

108. (New) The optical apparatus of claim 104 wherein each channel micromirror is continuously pivotable about at least one axis.

109. (New) The optical apparatus of claim 108 wherein each channel micromirrors is pivotable about two axes, and wherein said fiber collimators are arranged in a two-dimensional array.

110. (New) The optical apparatus of claim 104 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimators.

111. (New) An optical system comprising a wavelength-separating-routing apparatus, wherein said wavelength-separating-routing apparatus includes:

a) an array of fiber collimators, providing and serving as an input port for a multi-wavelength optical signal;

b) a plurality of output ports including a pass-through port and one or more drop ports;

c) a wavelength-separator, for separating said multi-wavelength optical signal from said fiber collimator input port into multiple spectral channels;

d) a beam-focuser, for focusing said spectral channels into corresponding spectral spots; and

e) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being pivotal about two axes and being individually and continuously controllable to reflect corresponding received

spectral channels into any selected ones of said output ports and to control the power of said received spectral channels coupled into said output ports, whereby said fiber collimator pass-through port receives a subset of said spectral channels.

112. (New) The optical system of claim 111 further comprising a servo-control assembly, in communication with said channel micromirrors and said output ports, for providing control of said channel micromirrors and thereby maintaining a predetermined coupling of each reflected spectral channel into one of said output ports.

113. (New) The optical system of claim 112 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors.

114. (New) The optical system of claim 111 further comprising an array of collimator-alignment mirrors, in optical communication with said wavelength-separator and said fiber collimators, for adjusting an alignment of said multi-wavelength optical signal from said fiber collimator input port and directing said reflected spectral channels into said output ports.

115. (New) The optical system of claim 114 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimators.

116. (New) The optical system of claim 114 wherein each collimator-alignment mirror is rotatable about at least one axis.

117. (New) The optical system of claim 111 wherein each channel micromirror is pivotable about at least one axis.

118. (New) The optical system of claim 111 wherein each channel micromirror is a silicon micromachined mirror.

119. (New) The optical system of claim 111 wherein said beam-focuser comprises a focusing lens having first and second focal points, and wherein said wavelength-separator and said channel micromirrors are placed respectively at said first and second focal points.

120. (New) The optical system of claim 111 wherein said wavelength-separator comprises an element selected from the group consisting of ruled diffraction gratings, holographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing prisms.

121. (New) The optical system of claim 111 further comprising a quarter-wave plate optically interposed between said wavelength-separator and said channel micromirrors.

122. (New) The optical system of claim 111 further comprising an auxiliary wavelength-separating-routing apparatus, including:

a) multiple auxiliary fiber collimators, providing and serving as a plurality of auxiliary input ports;

b) an exiting port;

c) an auxiliary wavelength-separator;

d) an auxiliary beam-focuser; and

e) a spatial array of auxiliary channel micromirrors;

wherein

said subset of said spectral channels in said fiber collimator pass-through port and one or more add spectral channels are directed into said fiber collimator auxiliary input ports, and multiplexed into an output optical signal directed into said exiting port by way of said auxiliary wavelength-separator, said auxiliary beam-focuser and said auxiliary channel micromirrors.

123. (New) The optical system of claim 122 wherein said auxiliary channel micromirrors are individually pivotable.

124. (New) The optical system of claim 122 wherein each auxiliary channel micromirror is pivotable continuously about at least one axis.

125. (New) The optical system of claim 122 wherein each auxiliary channel micromirror is a silicon micromachined mirror.

126. (New) The optical system of claim 122 wherein said auxiliary wavelength-separator comprises an element selected from the group consisting of ruled diffraction gratings, holographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing prisms.

127. (New) The optical system of claim 122 wherein said fiber collimator pass-through port constitutes one of said fiber collimator auxiliary input ports.

128. (New) A method of performing dynamic wavelength separating and routing, comprising:

a) receiving a multi-wavelength optical signal from a fiber collimator input port;
b) separating said multi-wavelength optical signal into multiple spectral channels;
c) focusing said spectral channels onto a spatial array of corresponding beam-deflecting elements, whereby each beam-deflecting element receives one of said spectral channels; and
d) dynamically and continuously controlling said beam-deflecting elements in two dimensions to direct said spectral channels into any selected ones of output ports and to control the power of the spectral channels coupled into said selected output ports.

129. (New) The method of claim 128 further comprising the step of providing feedback control of said beam-deflecting elements to maintain a predetermining coupling of each spectral channel directed into one of said output ports.

130. (New) The method of claim 129 further comprising the step of maintaining power levels of said spectral channels directed into said output ports at a predetermining value.

131. (New) The method of claim 128 wherein each spectral channel is directed into a separate output port.

132. (New) The method of claim 128 wherein a subset of said spectral channels is directed into one of said output ports, thereby providing one or more pass-through spectral channels.

133. (New) The method of claim 132 further comprising the step of multiplexing said pass-through spectral channels with one or more add spectral channels, so as to provide an output optical signal.

134. (New) The method of claim 128 wherein said beam-deflecting elements comprise an array of silicon micromachined mirrors.

135. (New) The wavelength-separating-routing apparatus of claim 68, wherein neither said multi-wavelength optical signal nor said spectral channels are transmitted through a circulator.

136. (New) The servo-based optical apparatus of claim 88, wherein neither said multi-wavelength optical signal nor said spectral channels are transmitted through a circulator.

137. (New) The optical apparatus of claim 98, wherein neither said multi-wavelength optical signal nor said spectral channels are transmitted through a circulator.

138. (New) The optical apparatus of claim 104, wherein neither said multi-wavelength optical signal nor said spectral channels are transmitted through a circulator.

139. (New) The optical system of claim 111, wherein neither said multi-wavelength optical signal nor said spectral channels are transmitted through a circulator.

Remarks

Reconsideration of this Application is respectfully requested.

Upon entry of the foregoing amendment, claims 68-139 are pending in the application, with claims 68, 88, 98, 104, 111, and 128 being the independent claims. Claims 72, 75, 78, 80, 91, and 92 are sought to be amended. Claims 1-67 were previously canceled without prejudice to or disclaimer of the subject matter therein. These changes are believed to introduce no new matter, and their entry is respectfully requested.

Applicant respectfully requests the Examiner enter these amendments after final rejections as they merely clarify the declaration error statement and they clarify the claims without requiring further search or consideration by the Examiner.

Based on the above amendment and the following remarks, Applicant respectfully requests that the Examiner reconsider all outstanding objections and rejections and that they be withdrawn. Throughout the arguments, Applicant reminds the Examiner that the claims are given their broadest reasonable meaning in view of the specification, and any paraphrasing of the claim features is not to be interpreted as reading any features into, or characterizing of, the claims.

Statement of Substance of Examiner Interview

The Examiners are thanked for their time during an Interview conducted on September 11, 2019 with Applicant's representatives Jason D. Eisenberg (Reg. No. 43,447), Sean Flood (Reg. No. 64,378), Roozbeh Gorgin (Reg. No. 75,269), and Tyler Dutton (Reg. No. 75,069). The Examiners provided guidance regarding all outstanding objections and rejections. Tentative agreement was reached that implementation of that guidance would result in allowance of the claims, barring an updated search. The Examiners helpful guidance is reflected in all the claim amendments and arguments presented herein. Finally, the Examiners are thanked for their indication they would continue to work with Applicants after this Amendment and Response is filed if anything further is needed for allowance.

Applicant generally agrees with the Interview Summary mailed September 17, 2019 unless noted below. And Applicant notes the Interview Summary mailed October 16, 2019.

Defective Reissue Declaration

Regarding claims 68-139, the Final Office Action of September 5, 2019 (hereinafter the "Final Office Action") beginning on page 6 states:

> "Claims 68-139 are rejected as being based upon a defective reissue declaration under 35 U.S.C. 251 as set forth above. See 37 CFR 1.175.
>
> The reissue oath/declaration filed with this application is defective (see 37 CFR 1.175 and MPEP § 1414) because the description of the error is insufficient to support the errors corrected via the JULY 2019 CLAIM AMENDMENTS.
>
> Specifically, the error described in the Reissue Declaration filed June 29, 2018 describes the error with respect to 'amended claim 1,' which has been cancelled. Thus, the description of the error no longer supports this reissue application. However, Applicant may identify the reissuable error **in the remarks** because a proper reissuable error has been previously entered into the application (see 37 CFR 1.175(f)(2) and MPEP §1451 (II)).
>
> It is sufficient that **the remarks** identify a single word, phrase, or expression in the specification or in an original claim, and how it renders the original patent wholly or partly inoperative or invalid (see MPEP §1414(II)). Thus, Examiners suggest providing the following statement in the remarks in response to this office action under 37 CFR 1 .175(f)(2), which Examiners find would obviate this. This statement is merely a suggestion.
>
>> 'This application narrows patent claim 1 by claiming the 'output port' of the wavelength-separating-routing apparatus is a 'fiber collimator output port' because merely claiming 'output port' without limiting the 'output port' to a 'fiber collimator output port' was unduly broad.'" [underlining and bold in original].

Applicant appreciates Examiner's suggested language. Applicant respectfully submits the following statement that both identifies the reissuable error that is the basis of this reissue application and meets all requirements of specificity found in MPEP § 1414(II)(A-C). For example, the statement points out both (1) a specific claim: claim 135, and (2) specific language: "neither said …are transmitted through a circulator":

> "The patent claims require transmission of a multi-wavelength optical signal and/or said spectral channels, whereas at least new dependent claim 135 also requires 'neither said multiwavelength optical signal nor said spectral channels are transmitted through a circulator.'"

Withdrawal of the rejection is respectfully requested.

Claim Rejections – 35 U.S.C. §112 and
Statement of Support for Claim Amendments – 37 C.F.R. § 1.173(c)

Claims 75, 91, and 92 are rejected under 35 U.S.C. § 112(b) or pre-AIA 35 U.S.C. § 112, second paragraph, as allegedly being indefinite. Applicant respectfully traverses

Regarding claims 75, 91, and 92, the Final Office Action beginning on page 7 states:

> Claims 75 and 91-92 are rejected under 35 U.S.C. 112 (pre-AlA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention.
>
> Specifically, the claim limitation '***said fiber collimators***' does not have an antecedent basis, which renders it insolubly ambiguous because '***said fiber collimators***' can be interpreted as: (1) the fiber collimators of the input ports, or alternatively (2) the fiber collimators of the output ports (i.e., the pass-through ports), or alternatively (3) the fiber collimators of the input ports and the fiber collimators of the output ports. More specifically, this ambiguity exits because it is unclear whether the claimed '***said fiber collimators***' of the WSR and/or OADM apparatus is the fiber collimator of the input ports or the fiber collimator of the pass-through ports.
>
> In contrast, the JULY 2019 claim amendments to base claims 98 and 112 have obviated a similar rejection of claims 103 and 113 with respect to the claim limitation '***said fiber collimators***,' which was presented in the Non-Final Action. Specifically, claims 103 and 113 are NOT indefinite because the claimed '***said fiber collimators***' must necessarily be the fiber collimators of the input ports because only fiber collimators of input ports is claimed whereas the '***said fiber collimators***' of claims 75 and 91-92 are ambiguous because the antecedent basis can be 1) the fiber collimators of the input ports or alternatively (2) the fiber collimators of the output ports (i.e., the pass-through ports), or alternatively (3) the fiber collimators of the input ports and the fiber collimators of the output ports." [bold, underline, and italics in original].

Without acquiescing to the propriety of the rejection, **claims 75, 91, and 92** have been amended in this Section. Additionally, as discussed during the Interview, **claims 72, 78 and 80** have also been amended in a later Section of this Response. In this Section and the later Section, Applicant has also provided an informally annotated set of claims showing changes between the last filed Response and this Response for these claims. Exemplary support for the claim amendments can be found in the specification of U.S. Reissue Patent RE42,678 (the "'678 patent") at:

Claim(s)	**Support**[1]
72, 75, 78, 80, 91, 92	FIGS. 2A, 2B, 2C and col. 9, lines 40-58

Regarding claim 75, the dependent claim has been clarified and amended to include the claim limitation of:

> "…The wavelength-separating-routing apparatus of claim 72 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimator input and output ports."

The support for the above amendment is found in the specification of the '678 patent in FIGS. 2A, 2B, 2C, and col. 9, lines 40-58, which states:

> "Depicted in FIG. 2A is a second embodiment of a WSR apparatus according to the present invention. By way of example, WSR apparatus 200 is built upon and hence shares a number of the elements used in the embodiment of FIG. 1A, as identified by those labeled with identical numerals. Moreover, a one-dimensional array 220 of collimator-alignment mirrors 220-1 through 220-N is optically interposed between the diffraction grating 101 and the fiber collimator array 110. The collimator-alignment mirror 220-1 is designated to correspond with the input port 110-1, for adjusting the alignment of the input multi-wavelength optical signal and therefore ensuring that the spectral channels impinge onto the corresponding channel micromirrors. The collimator-alignment mirrors 220-2 through 220-N are designated to the output ports 110-2 through 110-N in a one-to-one correspondence, serving to provide angular control of the collimator beams of the reflected spectral channels and thereby facilitating the coupling of the spectral channels into the respective output ports according to desired coupling efficiencies." [underlining added].

No new matter has been added.

[1] Citations are to U.S. Reissue Patent RE42,678 as published.

Applicant respectfully submits that the claim limitations above clarify that first and second arrays of imaging lenses (shown as elements 220-1 through 220-N in FIGS. 2A-2C of Applicant's specification) are in telecentric arrangement with both the fiber collimator input and output ports. Thus, there should no longer be any confusion as to what "said fiber collimators" reference. As a result, the claim is believed to be in allowable condition.

Regarding claim 91, the dependent claim has been clarified and amended to include the claim limitation of:

> "…The servo-based optical apparatus of claim 88 further comprising an array of collimator-alignment mirrors, in optical communication with said wavelength-separator and said fiber collimator input and output ports, for adjusting an alignment of said multi-wavelength optical signal from said fiber collimator input port and directing said reflected spectral channels into said fiber collimator output ports."

The support for the above amendment is found in the specification of the '678 patent in FIGS. 2A, 2B, 2C, and col. 9, lines 40-58, *supra*.

No new matter has been added.

Applicant respectfully submits that the claim limitations above clarify claim 91 based on the same reasoning as mentioned with respect to claim 75. For the same reasons there should no longer be any confusion as to what "said fiber collimators" references. As a result, the claim is believed to be in allowable condition.

Regarding claim 92, the dependent claim has been clarified and amended to include the claim limitation of:

> "… The servo-based optical apparatus of claim 91 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimator input and output ports."

The support for the above amendment is found in the specification of the '678 patent in FIGS. 2A, 2B, 2C, and col. 9, lines 40-58, *supra*.

No new matter has been added.

Applicant respectfully submits that the claim limitations above clarify claim 92 based on the same reasoning as mentioned with respect to claim 75. For the same reasons there should no longer

be any confusion as to what "said fiber collimators" references. As a result, the claim is believed to be in allowable condition.

Withdrawal of the rejections is respectfully requested

Allowable Subject Matter

Regarding claims 68-74, 76-90, and 93-139, the Final Office Action beginning on page 8 states:

> " If a sufficient description of the error to support this reissue application is providing in the remarks in response to this office action, then the following claims would be in condition for allowance because the 35 USC §251 rejection for a defective declaration would be obviated."

Applicant appreciates Examiner indicating claims 68-74, 76-90, and 93-139 are allowable pending a sufficient description of the error to support the reissue application. Applicant respectfully submits that the statement has been made above, *supra*. As a result, claims 68-74, 76-90, and 93-139 are in allowable condition and allowance is respectfully requested.

Other

As discussed during the Interview, Applicant reviewed all pending claims for issues similar to what the Examiner pointed to for claims 75, 91, and 92. Out of an abundance of caution Applicant has also clarified the following claims, informal annotations shown below correspond to the difference between the claim language in the last filed Response and this Response.

Regarding claim 72, the dependent claim has been clarified and amended to include the claim limitation of:

> "...The wavelength-separating-routing apparatus of claim 68 further comprising an array of collimator-alignment mirrors, in optical communication with said wavelength-separator and said fiber collimator input and output ports, for adjusting an alignment of said multi-wavelength optical signal from said fiber collimator input port and directing said reflected spectral channels into said fiber collimator output ports."

The support for the above amendment is found in the specification of the ’678 patent in FIGS. 2A, 2B, 2C, and col. 9, lines 40-58, *supra*.

No new matter has been added.

Applicant respectfully submits that while no rejection was made on the claim, the claim limitations have been added to clarify what “said fiber collimators” references.

Regarding claim 78, the dependent claim has been clarified and amended to include the claim limitation of:

> “… The wavelength-separating-routing apparatus of claim 77 wherein said fiber collimator input and output ports are arranged in a two-dimensional array.”

The support for the above amendment is found in the specification of the ’678 patent in FIGS. 2A, 2B, 2C, and col. 9, lines 40-58, *supra*.

No new matter has been added.

Applicant respectfully submits that while no rejection was made on the claim, the claim limitations have been added to clarify what “said fiber collimators” references.

Regarding claim 80, the dependent claim has been clarified and amended to include the claim limitation of:

> “… The wavelength-separating-routing apparatus of claim 68 wherein said fiber collimator input and output ports are arranged in a one-dimensional array.”

The support for the above amendment is found in the specification of the ’678 patent in FIGS. 2A, 2B, 2C, and col. 9, lines 40-58, *supra*.

No new matter has been added.

Applicant respectfully submits that while no rejection was made on the claim, the claim limitations have been added to clarify what “said fiber collimators” references.

Applicant respectfully submits that claims 78 and 80 are in condition for allowance.

Conclusion

All of the stated grounds of objection and rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider all presently outstanding objections and rejections and that they be withdrawn. Applicant believes that a full and complete reply has been made to the outstanding Office Action and, as such, the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Prompt and favorable consideration of this Amendment and Reply is respectfully requested.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

/Jason D. Eisenberg/

Jason D. Eisenberg
Attorney for Applicant
Registration No. 43,447

Date: October 23, 2019

1100 New York Avenue, N.W.
Washington, D.C. 20005-3934
(202) 371-2600

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventors: WILDE *et al.*	Confirmation No.: 3621
Applicant: CAPELLA PHOTONICS, INC.	Art Unit: 3992
Reissue Application No.: 16/023,183	Examiner: HUGHES, DEANDRA M.
Filing Date: June 29, 2018	Atty. Docket: 3564.015REI0

Title: **RECONFIGURABLE OPTICAL ADD-DROP MULTIPLEXERS WITH SERVO CONTROL AND DYNAMIC SPECTRAL POWER MANAGEMENT CAPABILITIES**

Amendment and Response in a Reissue Application Under 37 C.F.R. § 1.173(b) and Statement of Status and Support for all Changes to the Claims Under 37 C.F.R. § 1.173(c)

Mail Stop Amendment
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Commissioner:

In reply to the Office Action dated June 26, 2019, Applicant submits the following Amendment and Remarks.

It is not believed that extensions of time are required beyond those that may otherwise be provided for in documents accompanying this paper. However, if additional extensions of time are necessary to prevent abandonment of this application, then such extensions of time are hereby petitioned under 37 C.F.R. § 1.136(a), and any additional fees required to continue prosecution or appeal of this application (including issue fee, fees for net addition of claims or forwarding to appeal) are hereby authorized to be charged to our Deposit Account No. 19-0036.

Amendments to the Specification

Please add the following paragraph as the first sentence of the specification pursuant to 37 C.F.R. § 1.177:

This is a reissue of U.S. Reissue Patent No. RE42,678 (U.S. App. No. 12/815,930 filed June 15, 2010), which is a reissue of U.S. Reissue Patent No. RE39,397 (U.S. App. No. 11/027,586 filed on December 31, 2004), which is a reissue of U.S. Patent No. 6,625,346 (U.S. App. No. 09/938,426 filed September 23, 2003).

Amendments to the Claims

Please amend pending **claims 69-122 and 127-138**, as indicated below. Please amend canceled **claims 5-8, 11, 12, 14-16, 18, 24-26, 28, 30-43, 47-52, 54-56, 66, and 67**, as indicated below. **Claims 1-67** remain canceled. Applicant has also provided an informally annotated set of claims showing changes between the Second Preliminary Amendment and this Amendment and Response in an Appendix to this Amendment and Response. A complete listing of all claims and their status in the application is as follows:

~~1. A wavelength-separating-routing apparatus, comprising:~~

~~a) multiple fiber collimators, providing an input port for a multi-wavelength optical signal and a plurality of output ports;~~

~~b) a wavelength-separator, for separating said multi-wavelength optical signal from said input port into multiple spectral channels;~~

~~c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots; and~~

~~d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors~~ ~~*being pivotal about two axes and being*~~ ~~individually and continuously controllable to reflect [said]~~ ~~*corresponding received*~~ ~~spectral channels into any selected ones of said output ports~~ ~~*and to control the power of said received spectral channels coupled into said output ports*~~~~.~~

~~2. The wavelength-separating-routing apparatus of claim 1 further comprising a servo-control assembly, in communication with said channel micromirrors and said output ports, for providing control of said channel micromirrors and thereby maintaining a predetermined coupling of each reflected spectral channel into one of said output ports.~~

~~3. The wavelength-separating-routing apparatus of claim 2 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors.~~

~~4. The wavelength-separating-routing apparatus of claim 3 wherein said servo-control assembly maintains said power levels at a predetermined value.~~

5. (Canceled)

6. (Canceled)

7. (Canceled)

8. (Canceled)

~~9. The wavelength-separating-routing apparatus of claim 1 wherein each channel micromirror is continuously pivotable about one axis.~~

~~10. The wavelength-separating-routing apparatus of claim 1 wherein each channel micromirror is pivotable about two axes~~

11. (Canceled)

12. (Canceled)

~~13. The wavelength-separating-routing apparatus of claim 1 wherein said fiber collimators are arranged in a one-dimensional array.~~

14. (Canceled)

15. (Canceled)

16. (Canceled)

~~17. The wavelength-separating-routing apparatus of claim 1 wherein said wavelength-separator comprises an element selected from the group consisting of ruled diffraction gratings, halographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing gratings.~~

18. (Canceled)

~~19. The wavelength-separating-routing apparatus of claim 1 wherein each output port carries a single one of said spectral channels.~~

~~20. The wavelength-separating-routing apparatus of claim 19 further comprising one or more optical sensors, optically coupled to said output ports~~

~~21. A servo-based optical apparatus comprising:~~

~~a) multiple fiber collimators, providing an input port for a multi-wavelength optical signal and a plurality of output ports;~~

~~b) a wavelength-separator, for separating said multi-wavelength optical signal from said input port into multiple spectral channels;~~

~~c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots; and~~

~~d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being individually controllable to reflect said spectral channels into selected ones of said output ports; and~~

~~e) a servo-control assembly, in communication with said channel micromirrors and said output ports, for maintaining a predetermined coupling of each reflected spectral channel into one of said output ports.~~

~~22. The servo-based optical apparatus of claim 21 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors.~~

~~23. The servo-based optical apparatus of claim 22 wherein said servo-control assembly maintains said power levels at a predetermined value.~~

24. (Canceled)

25. (Canceled)

26. (Canceled)

~~27. The servo-based optical apparatus of claim 21 wherein each channel micromirror is continuously pivotable about at least one axis.~~

28. (Canceled)

~~29. The servo-based optical apparatus of claim 21 wherein said wavelength-separator comprises an element selected from the group consisting of ruled diffraction gratings, holographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing prisms.~~

30. (Canceled)

31. (Canceled)

32. (Canceled)

33. (Canceled)

34. (Canceled)

35. (Canceled)

36. (Canceled)

37. (Canceled)

38. (Canceled)

39. (Canceled)

40. (Canceled)

41. (Canceled)

42. (Canceled)

43. (Canceled)

~~44. An optical system comprising a wavelength-separating-routing apparatus, wherein said wavelength-separating-routing apparatus includes:~~

~~a) an array of fiber collimators, providing an input port for a multi-wavelength optical signal and a plurality of output ports including a pass-through port and one or more drop ports;~~

~~b) a wavelength-separator, for separating said multi-wavelength optical signal from said input port into multiple spectral channels;~~

~~c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots; and~~

~~d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being~~ ~~*pivotal about two axes and being*~~ ~~individually and continuously [pivotable]~~ ~~*controllable*~~ ~~to reflect [said]~~ ~~*corresponding received*~~ ~~spectral channels into~~ ~~*any*~~ ~~selected ones of said output ports~~ ~~*and to control the power of said received spectral channels coupled into said output ports*~~, ~~whereby said pass-through port receives a subset of said spectral channels.~~

~~45. The optical system of claim 44 further comprising a servo-control assembly, in communication with said channel micromirrors and said output ports, for providing control of said channel micromirrors and thereby maintaining a predetermined coupling of each reflected spectral channel into one of said output ports.~~

~~46. The optical system of claim 45 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors.~~

47. (Canceled)

48. (Canceled)

49. (Canceled)

50. (Canceled)

51. (Canceled)

52. (Canceled)

~~53. The optical system of claim 44 wherein said wavelength-separator comprises an element selected from the group consisting of ruled diffraction gratings, holographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing prisms.~~

54. (Canceled)

55. (Canceled)

56. (Canceled)

~~57. The optical system of claim 55 wherein each auxiliary channel micromirror is pivotable continuously about at least one axis.~~

~~58. The optical system of claim 55 wherein each auxiliary channel micromirror is a silicon micromachined mirror.~~

~~59. The optical system of claim 55 wherein said auxiliary wavelength-separator comprises an element selected from the group consisting of ruled diffraction gratings, holographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing prisms.~~

~~60. The optical system of claim 55 wherein said pass-through port constitutes one of said auxiliary input ports.~~

~~61. A method of performing dynamic wavelength separating and routing, comprising:~~

> ~~a) receiving a multi-wavelength optical signal from an input port;~~
>
> ~~b) separating said multi-wavelength optical signal into multiple spectral channels;~~
>
> ~~c) focusing said spectral channels onto a spatial array of corresponding beam-deflecting elements, whereby each beam-deflecting element receives one of said spectral channels; and~~
>
> ~~d) dynamically and continuously controlling said beam-deflecting elements[, thereby directing]~~ ~~*in two dimensions to direct*~~ ~~said spectral channels into [a plurality]~~ ~~*any selected ones*~~ ~~of~~ ~~*said*~~ ~~output ports~~ ~~*and to control the power of the spectral channels coupled into said selected output ports*~~~~.~~

~~62. The method of claim 61 further comprising the step of providing feedback control of said beam-deflecting elements[, thereby maintaining]~~ ~~*to maintain*~~ ~~a predetermining coupling of each spectral channel directed into one of said output ports.~~

~~63. The method of claim 62 further comprising the step of maintaining power levels of said spectral channels directed into said output ports at a predetermining value.~~

~~64. The method of claim 61 wherein each spectral channel is directed into a separate output port.~~

~~65. The method of claim 61 wherein a subset of said spectral channels is directed into one of said output ports, thereby providing one or more pass-through spectral channels.~~

66. (Canceled)

67. (Canceled)

68. (New) A wavelength-separating-routing apparatus, comprising:

a) multiple fiber collimators, providing and serving as an input port for a multi-wavelength optical signal and a plurality of output ports;

b) a wavelength-separator, for separating said multi-wavelength optical signal from said fiber collimator input port into multiple spectral channels;

c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots; and

d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being pivotal about two axes and being individually and continuously controllable to reflect corresponding received spectral channels into any selected ones of said fiber collimator output ports and to control the power of said received spectral channels coupled into said fiber collimator output ports.

69. (New) The wavelength-separating-routing apparatus of claim 68 further comprising a servo-control assembly, in communication with said channel micromirrors and said fiber collimator output ports, for providing control of said channel micromirrors and thereby maintaining a predetermined coupling of each reflected spectral channel into one of said fiber collimator output ports.

70. (New) The wavelength-separating-routing apparatus of claim 69 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said fiber collimator output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors.

71. (New) The wavelength-separating-routing apparatus of claim 70 wherein said servo-control assembly maintains said power levels at a predetermined value.

72. (New) The wavelength-separating-routing apparatus of claim 68 further comprising an array of collimator-alignment mirrors, in optical communication with said wavelength-separator and said fiber collimators, for adjusting an alignment of said multi-wavelength optical signal from said fiber collimator input port and directing said reflected spectral channels into said fiber collimator output ports.

73. (New) The wavelength-separating-routing apparatus of claim 72 wherein each collimator-alignment mirror is rotatable about one axis.

74. (New) The wavelength-separating-routing apparatus of claim 72 wherein each collimator-alignment mirror is rotatable about two axes.

75. (New) The wavelength-separating-routing apparatus of claim 72 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimators.

76. (New) The wavelength-separating-routing apparatus of claim 68 wherein each channel micromirror is continuously pivotable about one axis.

77. (New) The wavelength-separating-routing apparatus of claim 68 wherein each channel micromirror is pivotable about two axes.

78. (New) The wavelength-separating-routing apparatus of claim 77 wherein said fiber collimators are arranged in a two-dimensional array.

79. (New) The wavelength-separating-routing apparatus of claim 68 wherein each channel micromirror is a silicon micromachined mirror.

80. (New) The wavelength-separating-routing apparatus of claim 68 wherein said fiber collimators are arranged in a one-dimensional array.

81. (New) The wavelength-separating-routing apparatus of claim 68 wherein said beam-focuser comprises a focusing lens having first and second focal points.

82. (New) The wavelength-separating-routing apparatus of claim 81 wherein said wavelength-separator and said channel micromirrors are placed respectively at said first and second focal points of said focusing lens.

83. (New) The wavelength-separating-routing apparatus of claim 68 wherein said beam-focuser comprises an assembly of lenses.

84. (New) The wavelength-separating-routing apparatus of claim 68 wherein said wavelength-separator comprises an element selected from the group consisting of ruled diffraction gratings, holographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing gratings.

85. (New) The wavelength-separating-routing apparatus of claim 68 further comprising a quarter-wave plate optically interposed between said wavelength-separator and said channel micromirrors.

86. (New) The wavelength-separating-routing apparatus of claim 68 wherein each fiber collimator output port carries a single one of said spectral channels.

87. (New) The wavelength-separating-routing apparatus of claim 86 further comprising one or more optical sensors, optically coupled to said fiber collimator output ports.

88. (New) A servo-based optical apparatus comprising:

a) multiple fiber collimators, providing an input port for a multi-wavelength optical signal and a plurality of output ports;

b) a wavelength-separator, for separating said multi-wavelength optical signal from said fiber collimator input port into multiple spectral channels;

c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots; and

d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being individually controllable to reflect said spectral channels into selected ones of said fiber collimator output ports; and

e) a servo-control assembly, in communication with said channel micromirrors and said fiber collimator output ports, for maintaining a predetermined coupling of each reflected spectral channel into one of said fiber collimator output ports.

89. (New) The servo-based optical apparatus of claim 88 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said fiber collimator output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors.

90. (New) The servo-based optical apparatus of claim 89 wherein said servo-control assembly maintains said power levels at a predetermined value.

91. (New) The servo-based optical apparatus of claim 88 further comprising an array of collimator-alignment mirrors, in optical communication with said wavelength-separator and said fiber collimators, for adjusting an alignment of said multi-wavelength optical signal from said fiber collimator input port and directing said reflected spectral channels into said fiber collimator output ports.

92. (New) The servo-based optical apparatus of claim 91 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimators.

93. (New) The servo-based optical apparatus of claim 91 wherein each collimator-alignment mirror is rotatable about at least one axis.

94. (New) The servo-based optical apparatus of claim 88 wherein each channel micromirror is continuously pivotable about at least one axis.

95. (New) The servo-based optical apparatus of claim 88 wherein each channel micromirror is a silicon micromachined mirror.

96. (New) The servo-based optical apparatus of claim 88 wherein said wavelength-separator comprises an element selected from the group consisting of ruled diffraction gratings, holographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing prisms.

97. (New) The servo-based optical apparatus of claim 88 wherein said beam-focuser comprises one or more lenses.

98. (New) An optical apparatus comprising:

a) an array of fiber collimators providing and serving as an input port for a multi-wavelength optical signal;

b) a plurality of output ports;

c) a wavelength-separator, for separating said multi-wavelength optical signal from said fiber collimator input port into multiple spectral channels;

d) a beam-focuser, for focusing said spectral channels into corresponding spectral spots;

e) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being individually and continuously controllable to reflect said spectral channels into selected ones of said output ports; and

f) a one-dimensional array of collimator-alignment mirrors, for adjusting an alignment of said multi-wavelength optical signal from said fiber collimator input port and directing said reflected spectral channels into said output ports.

99. (New) The optical apparatus of claim 98 further comprising a servo-control assembly, in communication with said channel micromirrors, said collimator-alignment mirrors, and said output ports, for providing control of said channel micromirrors along with said collimator-alignment mirrors and thereby maintaining a predetermined coupling of each reflected spectral channel into one of said output ports.

100. (New) The optical apparatus of claim 99 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said output

ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors and said collimator-alignment mirrors.

101. (New) The optical apparatus of claim 98 wherein each channel micromirror is continuously pivotable about at least one axis.

102. (New) The optical apparatus of claim 98 wherein each collimator-alignment mirror is rotatable about at least one axis.

103. (New) The optical apparatus of claim 98 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimators.

104. (New) An optical apparatus comprising:

a) an array of fiber collimators, providing and serving as an input port for a multi-wavelength optical signal;

b) a plurality of output ports;

c) a wavelength-separator, for separating said multi-wavelength optical signal from said fiber collimator input port into multiple spectral channels;

d) a beam-focuser, for focusing said spectral channels into corresponding spectral spots;

e) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being individually and continuously controllable to reflect said spectral channels into selected ones of said output ports; and

f) a two-dimensional array of collimator-alignment mirrors, for adjusting an alignment of said multi-wavelength optical signal from said fiber collimator input port and directing said reflected spectral channels into said output ports.

105. (New) The optical apparatus of claim 104 further comprising a servo-control assembly, in communication with said channel micromirrors, and collimator-alignment mirrors, and said output ports, for providing control of said channel micromirrors along with said collimator-alignment

mirrors and thereby maintaining a predetermined coupling of each reflected spectral channel into one of said output ports.

106. (New) The optical apparatus of claim 105 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors and said collimator-alignment mirrors.

107. (New) The optical apparatus of claim 104 wherein each collimator-alignment mirror is rotatable about at least one axis.

108. (New) The optical apparatus of claim 104 wherein each channel micromirror is continuously pivotable about at least one axis.

109. (New) The optical apparatus of claim 108 wherein each channel micromirrors is pivotable about two axes, and wherein said fiber collimators are arranged in a two-dimensional array.

110. (New) The optical apparatus of claim 104 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimators.

111. (New) An optical system comprising a wavelength-separating-routing apparatus, wherein said wavelength-separating-routing apparatus includes:

a) an array of fiber collimators, providing and serving as an input port for a multi-wavelength optical signal;

b) a plurality of output ports including a pass-through port and one or more drop ports;

c) a wavelength-separator, for separating said multi-wavelength optical signal from said fiber collimator input port into multiple spectral channels;

d) a beam-focuser, for focusing said spectral channels into corresponding spectral spots; and

e) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being pivotal about two axes and being individually and continuously controllable to reflect corresponding received

spectral channels into any selected ones of said output ports and to control the power of said received spectral channels coupled into said output ports, whereby said fiber collimator pass-through port receives a subset of said spectral channels.

112. (New) The optical system of claim 111 further comprising a servo-control assembly, in communication with said channel micromirrors and said output ports, for providing control of said channel micromirrors and thereby maintaining a predetermined coupling of each reflected spectral channel into one of said output ports.

113. (New) The optical system of claim 112 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors.

114. (New) The optical system of claim 111 further comprising an array of collimator-alignment mirrors, in optical communication with said wavelength-separator and said fiber collimators, for adjusting an alignment of said multi-wavelength optical signal from said fiber collimator input port and directing said reflected spectral channels into said output ports.

115. (New) The optical system of claim 114 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimators.

116. (New) The optical system of claim 114 wherein each collimator-alignment mirror is rotatable about at least one axis.

117. (New) The optical system of claim 111 wherein each channel micromirror is pivotable about at least one axis.

118. (New) The optical system of claim 111 wherein each channel micromirror is a silicon micromachined mirror.

119. (New) The optical system of claim 111 wherein said beam-focuser comprises a focusing lens having first and second focal points, and wherein said wavelength-separator and said channel micromirrors are placed respectively at said first and second focal points.

120. (New) The optical system of claim 111 wherein said wavelength-separator comprises an element selected from the group consisting of ruled diffraction gratings, holographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing prisms.

121. (New) The optical system of claim 111 further comprising a quarter-wave plate optically interposed between said wavelength-separator and said channel micromirrors.

122. (New) The optical system of claim 111 further comprising an auxiliary wavelength-separating-routing apparatus, including:

a) multiple auxiliary fiber collimators, providing and serving as a plurality of auxiliary input ports;

b) an exiting port;

c) an auxiliary wavelength-separator;

d) an auxiliary beam-focuser; and

e) a spatial array of auxiliary channel micromirrors;

wherein

said subset of said spectral channels in said fiber collimator pass-through port and one or more add spectral channels are directed into said fiber collimator auxiliary input ports, and multiplexed into an output optical signal directed into said exiting port by way of said auxiliary wavelength-separator, said auxiliary beam-focuser and said auxiliary channel micromirrors.

123. (New) The optical system of claim 122 wherein said auxiliary channel micromirrors are individually pivotable.

124. (New) The optical system of claim 122 wherein each auxiliary channel micromirror is pivotable continuously about at least one axis.

125. (New) The optical system of claim 122 wherein each auxiliary channel micromirror is a silicon micromachined mirror.

126. (New) The optical system of claim 122 wherein said auxiliary wavelength-separator comprises an element selected from the group consisting of ruled diffraction gratings, holographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing prisms.

127. (New) The optical system of claim 122 wherein said fiber collimator pass-through port constitutes one of said fiber collimator auxiliary input ports.

128. (New) A method of performing dynamic wavelength separating and routing, comprising:

a) receiving a multi-wavelength optical signal from a fiber collimator input port;
b) separating said multi-wavelength optical signal into multiple spectral channels;
c) focusing said spectral channels onto a spatial array of corresponding beam-deflecting elements, whereby each beam-deflecting element receives one of said spectral channels; and
d) dynamically and continuously controlling said beam-deflecting elements in two dimensions to direct said spectral channels into any selected ones of output ports and to control the power of the spectral channels coupled into said selected output ports.

129. (New) The method of claim 128 further comprising the step of providing feedback control of said beam-deflecting elements to maintain a predetermining coupling of each spectral channel directed into one of said output ports.

130. (New) The method of claim 129 further comprising the step of maintaining power levels of said spectral channels directed into said output ports at a predetermining value.

131. (New) The method of claim 128 wherein each spectral channel is directed into a separate output port.

132. (New) The method of claim 128 wherein a subset of said spectral channels is directed into one of said output ports, thereby providing one or more pass-through spectral channels.

133. (New) The method of claim 132 further comprising the step of multiplexing said pass-through spectral channels with one or more add spectral channels, so as to provide an output optical signal.

134. (New) The method of claim 128 wherein said beam-deflecting elements comprise an array of silicon micromachined mirrors.

135. (New) The wavelength-separating-routing apparatus of claim 68, wherein neither said multi-wavelength optical signal nor said spectral channels are transmitted through a circulator.

136. (New) The servo-based optical apparatus of claim 88, wherein neither said multi-wavelength optical signal nor said spectral channels are transmitted through a circulator.

137. (New) The optical apparatus of claim 98, wherein neither said multi-wavelength optical signal nor said spectral channels are transmitted through a circulator.

138. (New) The optical apparatus of claim 104, wherein neither said multi-wavelength optical signal nor said spectral channels are transmitted through a circulator.

139. (New) The optical system of claim 111, wherein neither said multi-wavelength optical signal nor said spectral channels are transmitted through a circulator.

Remarks

Reconsideration of this Application is respectfully requested.

Upon entry of the foregoing amendment, claims 68-139 are pending in the application, with claims 68, 88, 98, 104, 111, 122, and 128 being the independent claims. Claims 69-122 and 127-138 are sought to be amended. Claims 1-67 were previously canceled without prejudice to or disclaimer of the subject matter therein. These changes are believed to introduce no new matter, and their entry is respectfully requested.

Based on the above amendment and the following remarks, Applicant respectfully requests that the Examiner reconsider all outstanding rejections and that they be withdrawn. Throughout the arguments, Applicant reminds the Examiner that the claims are given their broadest reasonable meaning in view of the specification, and any paraphrasing of the claim features is not to be interpreted as reading any features into, or characterizing of, the claims.

Statement of Substance of Examiner Interview

The Examiners are thanked for their time during an Interview conducted on July 16, 2009 with Applicant's representatives Robert Greene Sterne (Reg. No. 28,912), Jason D. Eisenberg (Reg. No. 43,447), Sean Flood (Reg. No. 64,378), and Roozbeh Gorgin (Reg. No. 75,269). The Examiners provided guidance regarding all outstanding rejections and objections. Tentative agreement was reached that implementation of that guidance would result in allowance of the claims, barring an updated search. The Examiner helpful guidance is reflected in all the claim amendments and arguments presented herein. Finally, the Examiners are thanked for their indication they would continue to work with Applicants after this Amendment and Response is filed if anything further is needed for allowance.

Applicant generally agrees with the Interview Summary mailed July 19, 2019 unless noted below.

Statement of Support for Claim Amendments -- 37 C.F.R. § 1.173(c)

Claims 69-87, 89-97, 99-103, 105-110, 112-122, 127, and 129-138 are amended to change their dependencies and clarify the output port in some embodiments. Exemplary support for the claim amendments can be found in the claims of U.S. Reissue Patent RE42,678 (the "'678 patent"). Applicant respectfully submits that the claims as originally filed are part of the disclosure and applicant may incorporate the claimed subject matter without being charged with adding "new matter." *See In re Benno*, 768 F.2d 1340, 1346 (Fed. Cir. 1985). Further support for the amendments can be found throughout the specification of the '678 patent at:

Claim(s)	**Support**[1]
69, 99, 105	4:30-44, 11:5-57
70	11:5-57
71, 90	6:3-7
72	9:34-58
73, 74, 93, 102, 107, 116	9:58-60
75	4:39-44
76, 77, 94, 101, 108, 117	3:64-4:2, 4:25-26
78, 80, 109	3:64-4:2, 4:25-26, 9:20-23
79, 95, 118, 134	4:22-25
81, 83, 97	9:1-3, 10:9-21
82	9:61-10:21
84	4:15-20
85, 121	7:59-67
86, 91	9:34-58
87	11:65-67, 12:29-36
89, 100, 106	11:5-57
92, 103, 110, 115	7:32-38, 10:4-9, 10:38-43

[1] Citations are to U.S. Reissue Patent RE42,678 as published.

96, 120	4:15-20, 8:63-9:1
112, 131	4:45-52
113	3:32-44
114	4:30-36
119	9:1-3, 9:61-10:21
122, 127	3:54-57, 4:26-27, 5:20-22, 6:54-60, 7:6-11, 11:26-30, 12:45-48, 13:1-12, 13:33-39
129	11:21-26
130	11:30-34
132	3:54-57, 4:26-27, 5:20-22, 6:54-60, 12:45-48, 13:1-12
133	5:14-17
135, 136, 137, 138, 139	3:6-9

Objections

Regarding claims 1-139, the Non-Final Office Action of June 26, 2019 (hereinafter the "Non-Final Office Action") beginning on page 4 states:

> " The markings of the MARCH 2019 CLAIM AMENDMENTS is objected to because matter omitted via the *Inter Partes* Review Certificate should be lined-through, matter omitted via the instant application should be triple-bracketed, and matter added via the instant application should be tripled underlined.
>
> …
>
> Claims 1-4, 9, 10, 13, 17, 19-23, 27, 29, 44-46, 53 and 61-65 of R2 should be lined-through because they are cancelled via *Inter Partes* Review Certificate issued Dec. 10, 2018 (see MPEP §1453(VI)(B)).
>
> Claims 5-8, 11-12, 14-16, 18, 24-26, 28, 30-43, 47-52, 54-56, and 66-67 of R2 may be cancelled merely by directing, in writing, the cancellation of the patent claim (see MPEP §1453(V)(B)).
>
> Alternatively, claims 5-8, 11-12, 14-16, 18, 24-26, 28, 30-43, 47-52, 54-56, and 66-67 of R2 may be cancelled by enclosing the entire claim in triple bracketing (e.g., '[[[this is deleted subject matter enclosed by double bracketing]]]') because they are being cancelled via the instant application (R2), which is a reissue of a reissue (R1) (see MPEP §1453(VI)(A)).
>
> Claims 68-139, which were added via the MARCH 2019 CLAIM AMENDMENTS, should be triple underlined because they are being added via the

instant application (R3), which is a reissue of a reissue (R2), which is a reissue of a reissue (R1) (see MPEP §1453(VI)(A)).” [underlining and italics in original].

Applicant respectfully submits that the claims have been formatted pursuant to Examiner’s suggestions. Applicant respectfully requests that the objections be withdrawn.

Allowable Subject Matter

Regarding claim 68, the Non-Final Office Action beginning on page 8 states:

“ Claim 68 would be in condition for allowance if the provisional double patenting rejections are obviated. Specifically, the prior art does not disclose or make obvious ***‘[a] wavelength-separating-routing apparatus comprising...spatial array of channel micromirrors...to reflect corresponding received spectral channels into any selected ones of said fiber collimator outputs’*** in combination with the other limitations of the claims.” [bold, underline, and italics in original].

While Applicant respectfully disagrees, to further prosecution Applicant submits a terminal disclaimer along with this Amendment disclaiming the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of co-pending Application No. 16/023,127 (the “’127 application”) (which is a reissue application of previously issued U.S. Patent No. RE42,368, which is a reissue application of previously issued U.S. Patent No. 6,879,750). Applicant respectfully submits the submission of the terminal disclaimer places claim 68 in allowable condition and allowance is respectfully requested.

Regarding claims 69-87 and 135, the Non-Final Office Action beginning on page 8 states:

“ Claims 69-87 and 135 are rejected under 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention.

Specifically, the claim dependencies of the dependent claims are circular. More specifically, the dependent claims ultimately depend upon either claim 73 and claim 77 and claim 73 is claimed as being dependent upon claim 77 and claim 73 is claimed as being dependent upon claim 77, which creates an infinite loop.

Since base claim 68 contains allowable subject matter, dependent claims 69-87 and 135 would likely be placed in condition for allowance if the issues with the claim dependency are obviated.

Also as to claim 75, the claim limitation ***‘said fiber collimators’*** does not have an antecedent basis and insolubly ambiguous because ***‘said fiber collimators’*** can be interpreted as: (1) the fiber collimators of the input ports, (2) the fiber

> collimators of the output ports, or (3) the fiber collimators of the input ports and the fiber collimators of the output ports." [bold, underlining, and italics in original].

Applicant respectfully submits that these dependent claims have been amended to correct the dependencies which further correct any antecedent basis problems. Further these dependent claims depend on independent claim 68, and are believed to be allowable since they include all the limitations set forth in the independent claim from which they depend and claim additional combinations thereof.

Regarding claim 88, the Non-Final Office Action beginning on page 9 states:

> " Claim 88 would be in condition for allowance if the provisional double patenting rejections are obviated. Specifically, the prior art does not disclose or make obvious ***'[a] servo-based optical apparatus comprising...spatial array of channel micromirrors...to reflect corresponding received spectral channels into any selected ones of said fiber collimator outputs'*** in combination with the other limitations of the claims." [bold, underline, and italics in original].

While Applicant respectfully disagrees, to further prosecution Applicant submits a terminal disclaimer along with this Amendment disclaiming the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of the co-pending '127 application. Applicant respectfully submits the submission of the terminal disclaimer places claim 88 in allowable condition and allowance is respectfully requested.

Regarding claims 89-97 and 136, the Non-Final Office Action beginning on page 9 states:

> " Claims 89-97 and 136 are rejected under 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention.
>
> Specifically, the claim dependencies of the dependent claims are circular. More specifically, the dependent claims ultimately depend upon either claim 93 and claim 96 and claim 93 is claimed as being dependent upon claim 96 and claim 96 is claimed as being dependent upon claim 93, which creates an infinite loop
>
> Since base claim 88 contains allowable subject matter, dependent claims 89-97 and 136 would likely be placed in condition for allowance if the issues with the claim dependency are obviated.
>
> Also as to claims 91-92, the claim limitation ***'said fiber collimators'*** does not have an antecedent basis and insolubly ambiguous because ***'said fiber collimators'*** can be interpreted as: (1) the fiber collimators of the input ports, (2)

> the fiber collimators of the output ports, or (3) the fiber collimators of the input ports and the fiber collimators of the output ports." [bold, underlining, and italics in original].

Applicant respectfully submits that these dependent claims have been amended to correct the dependencies which further correct any antecedent basis problems. Further these dependent claims depend on independent claim 88, and are believed to be allowable since they include all the limitations set forth in the independent claim from which they depend and claim additional combinations thereof.

Regarding claim 114, Non-Final Office Action beginning on page 20 states:

> " Claim 114 would be in condition for allowance if the provisional double patenting rejections are obviated. Specifically, the prior art does not disclose or make obvious ***'said WSR apparatus includes...a spatial array of channel micromirrors...to reflect corresponding received spectral channels into any selected ones of said fiber collimator output ports'*** in combination with the other limitations of the claims." [bold, underline, and italics in original].

While Applicant respectfully disagrees, to further prosecution Applicant submits a terminal disclaimer along with this Amendment disclaiming the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of the co-pending '127 application. Applicant respectfully submits the submission of the terminal disclaimer places claim 114 in allowable condition and allowance is respectfully requested.

Regarding claims 115 and 116, the Non-Final Office Action beginning on page 20 states:

> " Claims 115-130 and 139 are rejected under 35 U.S.C. 112 (pre-AlA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention.
>
> Specifically, most of the claims depend upon claim 119 and claim 119 depends on itself. In addition, the other claims depend upon claim 116 and claim 116 depends upon claim 117 and claim 117 depends upon claim 116.
>
> Since base claim 114 contains allowable subject matter, dependent claims 115-130 and 139 would likely be placed in condition for allowance if the issues with the claim dependency are obviated.
>
> Also as to claim 118, the claim limitation ***'said fiber collimators'*** does not have an antecedent basis and insolubly ambiguous because ***'said fiber collimators'*** can be interpreted as: (1) the fiber collimators of the input ports, (2) the fiber collimators of the output ports, or (3) the fiber collimators of the input ports and

> the fiber collimators of the output ports." [bold, underlining, and italics in original].

Applicant respectfully submits that these dependent claims have been amended to correct the dependencies which further correct any antecedent basis problems. Further these dependent claims depend on dependent claim 114, and are believed to be allowable since they include all the limitations set forth in the independent claim from which they depend and claim additional combinations thereof.

Regarding claims 117-127 and 139, the Non-Final Office Action beginning on page 20 states:

> " Claims 115-130 and 139 are rejected under 35 U.S.C. 112 (pre-AlA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention.
>
> Specifically, most of the claims depend upon claim 119 and claim 119 depends on itself. In addition, the other claims depend upon claim 116 and claim 116 depends upon claim 117 and claim 117 depends upon claim 116.
>
> Since base claim 114 contains allowable subject matter, dependent claims 115-130 and 139 would likely be placed in condition for allowance if the issues with the claim dependency are obviated.
>
> Also as to claim 118, the claim limitation *'**said fiber collimators**'* does not have an antecedent basis and insolubly ambiguous because *'**said fiber collimators**'* can be interpreted as: (1) the fiber collimators of the input ports, (2) the fiber collimators of the output ports, or (3) the fiber collimators of the input ports and the fiber collimators of the output ports." [bold, underlining, and italics in original].

Applicant respectfully submits that these dependent claims have been amended to correct the dependencies which further correct any antecedent basis problems. Further these dependent claims depend on independent claim 111, and are believed to be allowable since they include all the limitations set forth in the independent claim from which they depend and claim additional combinations thereof, as further explained below, *infra*.

Regarding claim 128, the Non-Final Office Action beginning on page 21 states:

> " Claim 128 would be in condition for allowance if the provisional double patenting rejections are obviated. Specifically, the prior art does not disclose or make obvious *'**a method of performing dynamic wavelength separating and routing comprising...dynamically and continuous controlling said beam-deflecting elements in two dimensions to direct said spectral channels into any***

> ***selected ones of fiber collimator output ports...*** ' in combination with the other limitations of the claims." [bold, underlining, and italics in original].

While Applicant respectfully disagrees, to further prosecution Applicant submits a terminal disclaimer along with this Amendment disclaiming the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of the co-pending '127 application. Applicant respectfully submits the submission of the terminal disclaimer places claim 128 in allowable condition and allowance is respectfully requested.

Regarding claims 129-134, the Non-Final Office Action beginning on page 21 states:

> " Claims 129-134 are rejected under 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention. Specifically, the claims depend upon claims 133 and 134 and claim 133 depends on claim 134 and claim 134 depends on claim 133. Since base claim 128 contains allowable subject matter, dependent claims 129-134 would likely be placed in condition for allowance if the issues with the claim dependency are obviated." [underlining in original].

Applicant respectfully submits that these dependent claims have been amended to correct the dependencies which further correct any antecedent basis problems. Further these dependent claims depend on independent claim 128, and are believed to be allowable since they include all the limitations set forth in the independent claim from which they depend and claim additional combinations thereof.

For the aforementioned reasons, **claims 68-97, 114-136, and 139** are in allowable condition and allowance is respectfully requested.

Double Patenting

Regarding claims 98, 104, 107, and 114, the Non-Final Office Action beginning on page 21 states:

> " Claims 98, 104, 107, and 114 are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claim 23 of copending Application No. 16/023,127 (reference application). Although the claims at issue

> are not identical, they are not patentably distinct from each other for the following reasons.
>
> Specifically, instant claims 98, 104, 107, and 114 are merely broader than reference claim 23 because the instant claims claim an ***'optical apparatus'*** and the reference claims claim an ***'OADM'*** and ***'optical apparatus'*** is broad enough to encompass an OADM, a WSR, and a servo-based optical apparatus.
>
> This is a provisional nonstatutory double patenting rejection because the patentably indistinct claims have not in fact been patented." [bold, underlining, and italics in original].

While Applicant respectfully disagrees, to further prosecution Applicant submits a terminal disclaimer along with this Amendment disclaiming the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of the co-pending '127. Applicant respectfully submits the submission of the terminal disclaimer places claims 98, 104, 107, and 114 in allowable condition and allowance is respectfully requested.

Claim Rejections – 35 USC § 251

Claims 98-113, 137, and 138 are rejected under 35 U.S.C. § 251 as allegedly being based upon new matter added to the patent for which reissue is sought.

Regarding claims 98, 104, and 111, the Non-Final Office Action beginning on page 10 states:

> " Claims 98-99, 101-103, and 137 are rejected under 35 U.S.C. 251 as being based upon new matter added to the patent for which reissue is sought. The added material which is not supported by the prior patent is ***'[a]n optical apparatus comprising an array of fiber collimators serving as...a plurality of output ports...said fiber collimator output ports ....'***
>
> In other words, Examiners find support for fiber collimator output ports of the WSR apparatus (figs. 1A, 2A, 2B, 3) and support the for fiber collimator output ports of the servo-based optical apparatus (figs. 4A and 4B) but do not find support for fiber collimator output ports of the optical add-drop multiplexer (figs. 5 and 6)." [bold, underlining, and italics in original].

The Non-Final Office Action beginning on page 18 further states:

> " Claims 100, 104-106, and 138 are rejected under 35 U.S.C. 251 as being based upon new matter added to the patent for which reissue is sought. The added

> material which is not supported by the prior patent is ***'[a]n optical apparatus comprising an array of fiber collimators serving as...a plurality of output ports...said fiber collimator output ports....'*** The reasoning for the §251 new matter rejections of claims 98-99, 101-103, and 137 are incorporated here." [bold, underlining, and italics in original].

The Non-Final Office Action beginning on page 19 further states:

> " Claims 107-113 are rejected under 35 U.S.C. 251 as being based upon new matter added to the patent for which reissue is sought. The added material which is not supported by the prior patent is ***'[a]n optical apparatus comprising an array of fiber collimators serving as...a plurality of output ports...said fiber collimator output ports....'*** The reasoning for the §251 new matter rejections of claims 98-99, 101-103, and 137 are incorporated here." [bold, underlining, and italics in original].

Applicant respectfully disagrees, but in order to advance prosecution, Applicant has amended the claims to remove the limitation of the fiber collimators serving as output ports. While Applicant has amended the claims in conformance with the agreement reached in the Examiner Interview, Applicant respectfully traverses the rejections because the claim limitation of "[a]n optical apparatus comprising an array of fiber collimators serving as...a plurality of output ports...said fiber collimator output ports ...." is supported throughout the specification of RE42,678 (the "'678 patent"). While Applicant previously indicated in its Second Preliminary Amendment where support can be found for the above amendments in the '678 patent, Applicant respectfully points Examiner to another specific example, '678 patent col. 5, lines 1-17, which states:

> " Accordingly, the WSR-S (or WSR) apparatus of the present invention may be used to construct a variety of optical devices, including a novel class of dynamically reconfigurable optical add-drop multiplexers (OADMs), as exemplified in the following embodiments.
>
> One embodiment of an OADM of the present invention comprises an aforementioned WSR-S (or WSR) apparatus and an optical combiner. The output ports of the WSR-S apparatus include a pass-through port and one or more drop ports, each carrying any number of the spectral channels. The optical combiner is coupled to the pass-through port, serving to combine the pass-through channels with one or more add spectral channels. The combined optical signal constitutes an output signal of the system. The optical combiner may be an Nx1 ($N \leq 2$) broadband fiber-optic coupler, for instance, 15 which also serves the purpose of multiplexing a multiplicity of add spectral channels to be coupled into the system."

The above paragraph indicates that the OADMs can be created using the WSR apparatus. As indicated in the Non-Final Office Action beginning on page 10, *supra*, Examiner admits to finding support for fiber collimator output ports of the WSR apparatus (figs. 1A, 2A, 2B, 3). Thus, it follows that if OADMs can be created using the WSR apparatus, there is support for OADMs having fiber collimator output ports via the WSR apparatus having fiber collimators as output ports. Similar statements are found in ’678 patent col. 5, lines 18-48, col. 12, lines 36-45, col. 13, lines 18-24, which indicate that the OADMs are created using the WSR apparatus that contains the fiber collimators.

Thus, Applicant respectfully submits that the claimed limitations above do not add any new matter because support can be found for the above amendment in the specification of the ’678 patent and because according to MPEP § 1411.02:

> “The claims in the reissue application must be for subject matter which the applicant had the right to claim in the original patent.”

Regarding claims 99-103, 105-110, 112, 113, 137, and 138, these dependent claims depend on independent claims 98, 104, and 111, and are believed to be allowable since they include all the limitations set forth in the independent claims from which they depend and claim additional combinations thereof.

Withdrawal of the rejections is respectfully requested.

Claim Rejections – 35 USC §112

Claims 99, 101-103, 105, 106, 108-113, 137, and 138 are rejected under 35 U.S.C. § 112(b), or pre-AIA 35 U.S.C. § 112, second paragraph as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention.

Regarding claims 99, 101-103, 105, 106, 108-113, 137, and 138, Applicant respectfully submits that these dependent claims have been amended to correct the dependencies which further correct any antecedent basis problems. Further these dependent claims depend on independent

claims 98, 104, and 111, and are believed to be allowable since they include all the limitations set forth in the independent claim from which they depend and claim additional combinations thereof.

Withdrawal of the rejections is respectfully requested.

Conclusion

All of the stated grounds of objection and rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider all presently outstanding objections and rejections and that they be withdrawn. Applicant believes that a full and complete reply has been made to the outstanding Office Action and, as such, the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Prompt and favorable consideration of this Amendment and Reply is respectfully requested.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

/Jason D. Eisenberg/

Jason D. Eisenberg
Attorney for Applicant
Registration No. 43,447

Date: July 30, 2019

1100 New York Avenue, N.W.
Washington, D.C. 20005-3934
(202) 371-2600

13492237

CLAIMS APPENDIX – MPEP 1453(V)(D) – Annotated New Claims

As reissue rules do not allow for showing changes with respect to the last amendment file, but rather only changes with respect to the patent being reissued, Applicant provides the following informally annotated claims showing changes between the Second Preliminary Amendment and this Amendment.

68. (New) A wavelength-separating-routing apparatus, comprising:

a) multiple fiber collimators, providing and serving as an input port for a multi-wavelength optical signal and a plurality of output ports;

b) a wavelength-separator, for separating said multi-wavelength optical signal from said fiber collimator input port into multiple spectral channels;

c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots; and

d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being pivotal about two axes and being individually and continuously controllable to reflect corresponding received spectral channels into any selected ones of said fiber collimator output ports and to control the power of said received spectral channels coupled into said fiber collimator output ports.

69. (New, amended) The wavelength-separating-routing apparatus of claim [[[73]]] 68 further comprising a servo-control assembly, in communication with said channel micromirrors and said fiber collimator output ports, for providing control of said channel micromirrors and thereby maintaining a predetermined coupling of each reflected spectral channel into one of said fiber collimator output ports.

70. (New, amended) The wavelength-separating-routing apparatus of claim [[[74]]] 69 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said fiber collimator output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors.

71. (New, amended) The wavelength-separating-routing apparatus of claim [[[75]]] 70 wherein said servo-control assembly maintains said power levels at a predetermined value.

72. (New, amended) The wavelength-separating-routing apparatus of claim [[[73]]] 68 further comprising an array of collimator-alignment mirrors, in optical communication with said wavelength-separator and said fiber collimators, for adjusting an alignment of said multi-wavelength optical signal from said fiber collimator input port and directing said reflected spectral channels into said fiber collimator output ports.

73. (New, amended) The wavelength-separating-routing apparatus of claim [[[77]]] 72 wherein each collimator-alignment mirror is rotatable about one axis.

74. (New, amended) The wavelength-separating-routing apparatus of claim [[[77]]] 72 wherein each collimator-alignment mirror is rotatable about two axes.

75. (New, amended) The wavelength-separating-routing apparatus of claim [[[75]]] 72 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimators.

76. (New, amended) The wavelength-separating-routing apparatus of claim [[[73]]] 68 wherein each channel micromirror is continuously pivotable about one axis.

77. (New, amended) The wavelength-separating-routing apparatus of claim [[[73]]] 68 wherein each channel micromirror is pivotable about two axes.

78. (New, amended) The wavelength-separating-routing apparatus of claim [[[82]]] 77 wherein said fiber collimators are arranged in a two-dimensional array.

79. (New, amended) The wavelength-separating-routing apparatus of claim [[[73]]] 68 wherein each channel micromirror is a silicon micromachined mirror.

80. (New, amended) The wavelength-separating-routing apparatus of claim [[[73]]] 68 wherein said fiber collimators are arranged in a one-dimensional array.

81. (New, amended) The wavelength-separating-routing apparatus of claim [[[73]]] 68 wherein said beam-focuser comprises a focusing lens having first and second focal points.

82. (New, amended) The wavelength-separating-routing apparatus of claim [[[86]]] 81 wherein said wavelength-separator and said channel micromirrors are placed respectively at said first and second focal points of said focusing lens.

83. (New, amended) The wavelength-separating-routing apparatus of claim [[[73]]] 68 wherein said beam-focuser comprises an assembly of lenses.

84. (New, amended) The wavelength-separating-routing apparatus of claim [[[73]]] 68 wherein said wavelength-separator comprises an element selected from the group consisting of ruled diffraction gratings, holographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing gratings.

85. (New, amended) The wavelength-separating-routing apparatus of claim [[[73]]] 68 further comprising a quarter-wave plate optically interposed between said wavelength-separator and said channel micromirrors.

86. (New, amended) The wavelength-separating-routing apparatus of claim [[[73]]] 68 wherein each fiber collimator output port carries a single one of said spectral channels.

87. (New, amended) The wavelength-separating-routing apparatus of claim [[[91]]] 86 further comprising one or more optical sensors, optically coupled to said fiber collimator output ports.

88. (New) A servo-based optical apparatus comprising:

a) multiple fiber collimators, providing an input port for a multi-wavelength optical signal and a plurality of output ports;

b) a wavelength-separator, for separating said multi-wavelength optical signal from said fiber collimator input port into multiple spectral channels;

c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots; and

d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being individually controllable to reflect said spectral channels into selected ones of said fiber collimator output ports; and

e) a servo-control assembly, in communication with said channel micromirrors and said fiber collimator output ports, for maintaining a predetermined coupling of each reflected spectral channel into one of said fiber collimator output ports.

89. (New, amended) The servo-based optical apparatus of claim [[[93]]] 88 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said fiber collimator output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors.

90. (New, amended) The servo-based optical apparatus of claim [[[94]]] 89 wherein said servo-control assembly maintains said power levels at a predetermined value.

91. (New, amended) The servo-based optical apparatus of claim [[[93]]] 88 further comprising an array of collimator-alignment mirrors, in optical communication with said wavelength-separator and said fiber collimators, for adjusting an alignment of said multi-wavelength optical signal from said fiber collimator input port and directing said reflected spectral channels into said fiber collimator output ports.

92. (New, amended) The servo-based optical apparatus of claim [[[96]]] 91 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimators.

93. (New, amended) The servo-based optical apparatus of claim [[[96]]] 91 wherein each collimator-alignment mirror is rotatable about at least one axis.

94. (New, amended) The servo-based optical apparatus of claim [[[93]]] 88 wherein each channel micromirror is continuously pivotable about at least one axis.

95. (New, amended) The servo-based optical apparatus of claim [[[93]]] 88 wherein each channel micromirror is a silicon micromachined mirror.

96. (New, amended) The servo-based optical apparatus of claim [[[93]]] 88 wherein said wavelength-separator comprises an element selected from the group consisting of ruled diffraction

gratings, holographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing prisms.

97. (New, amended) The servo-based optical apparatus of claim [[[93]]] 88 wherein said beam-focuser comprises one or more lenses.

98. (New, amended) An optical apparatus comprising:

a) an array of fiber collimators providing and serving as an input port for a multi-wavelength optical signal; [[[and]]]

b) a plurality of output ports;

[[[b]]] c) a wavelength-separator, for separating said multi-wavelength optical signal from said fiber collimator input port into multiple spectral channels;

[[[c]]] d) a beam-focuser, for focusing said spectral channels into corresponding spectral spots;

[[[d]]] e) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being individually and continuously controllable to reflect said spectral channels into selected ones of said [[[fiber collimator]] output ports; and

[[[e]]] f) a one-dimensional array of collimator-alignment mirrors, for adjusting an alignment of said multi-wavelength optical signal from said fiber collimator input port and directing said reflected spectral channels into said [[[fiber collimator]]] output ports.

99. (New, amended) The optical apparatus of claim [[[103]]] 98 further comprising a servo-control assembly, in communication with said channel micromirrors, said collimator-alignment mirrors, and said [[[fiber collimator]]] output ports, for providing control of said channel micromirrors along with said collimator-alignment mirrors and thereby maintaining a predetermined coupling of each reflected spectral channel into one of said [[[fiber collimator]]] output ports.

100. (New, amended) The optical apparatus of claim [[[104]]] 99 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels

coupled into said [[[fiber collimator]]] output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors and said collimator-alignment mirrors.

101. (New, amended) The optical apparatus of claim [[[103]]] 98 wherein each channel micromirror is continuously pivotable about at least one axis.

102. (New, amended) The optical apparatus of claim [[[103]]] 98 wherein each collimator-alignment mirror is rotatable about at least one axis.

103. (New, amended) The optical apparatus of claim [[[103]]] 98 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimators.

104. (New, amended) An optical apparatus comprising:

a) an array of fiber collimators, providing and serving as an input port for a multi-wavelength optical signal; [[[and]]]

b) a plurality of output ports;

[[[b]]] c) a wavelength-separator, for separating said multi-wavelength optical signal from said fiber collimator input port into multiple spectral channels;

[[[c]]] d) a beam-focuser, for focusing said spectral channels into corresponding spectral spots;

[[[d]]] e) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being individually and continuously controllable to reflect said spectral channels into selected ones of said [[[fiber collimator]]] output ports; and

[[[e]]] f) a two-dimensional array of collimator-alignment mirrors, for adjusting an alignment of said multi-wavelength optical signal from said fiber collimator input port and directing said reflected spectral channels into said [[[fiber collimator]]] output ports.

105. (New, amended) The optical apparatus of claim [[[109]]] 104 further comprising a servo-control assembly, in communication with said channel micromirrors, and collimator-alignment mirrors, and said [[[fiber collimator]]] output ports, for providing control of said channel

micromirrors along with said collimator-alignment mirrors and thereby maintaining a predetermined coupling of each reflected spectral channel into one of said [[[fiber collimator]]] output ports.

106. (New, amended) The optical apparatus of claim [[[110]]] 105 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said [[[fiber collimator]]] output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors and said collimator-alignment mirrors.

107. (New, amended) The optical apparatus of claim [[[109]]] 104 wherein each collimator-alignment mirror is rotatable about at least one axis.

108. (New, amended) The optical apparatus of claim [[[109]]] 104 wherein each channel micromirror is continuously pivotable about at least one axis.

109. (New, amended) The optical apparatus of claim [[[113]]] 108 wherein each channel micromirrors is pivotable about two axes, and wherein said fiber collimators are arranged in a two-dimensional array.

110. (New, amended) The optical apparatus of claim [[[109]]] 104 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimators.

111. (New, amended) An optical system comprising a wavelength-separating-routing apparatus, wherein said wavelength-separating-routing apparatus includes:

a) an array of fiber collimators, providing and serving as an input port for a multi-wavelength optical signal; [[[and]]]

b) a plurality of output ports including a pass-through port and one or more drop ports;

[[[b]]] c) a wavelength-separator, for separating said multi-wavelength optical signal from said fiber collimator input port into multiple spectral channels;

[[[c]]] d) a beam-focuser, for focusing said spectral channels into corresponding spectral spots; and

[[[d]]] e) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being pivotal about two axes and being individually and continuously controllable to reflect corresponding received spectral channels into any selected ones of said [[[fiber collimator]]] output ports and to control the power of said received spectral channels coupled into said [[[fiber collimator]]] output ports, whereby said fiber collimator pass-through port receives a subset of said spectral channels.

112. (New, amended) The optical system of claim [[[116]]] 111 further comprising a servo-control assembly, in communication with said channel micromirrors and said [[[fiber collimator]]] output ports, for providing control of said channel micromirrors and thereby maintaining a predetermined coupling of each reflected spectral channel into one of said [[[fiber collimator]]] output ports.

113. (New, amended) The optical system of claim [[[117]]] 112 wherein said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said [[[fiber collimator]]] output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors.

114. (New, amended) The optical system of claim [[[116]]] 111 further comprising an array of collimator-alignment mirrors, in optical communication with said wavelength-separator and said fiber collimators, for adjusting an alignment of said multi-wavelength optical signal from said fiber collimator input port and directing said reflected spectral channels into said [[[fiber collimator]]] output ports.

115. (New, amended) The optical system of claim [[[119]]] 114 further comprising first and second arrays of imaging lenses, in a telecentric arrangement with said collimator-alignment mirrors and said fiber collimators.

116. (New, amended) The optical system of claim [[[119]]] 114 wherein each collimator-alignment mirror is rotatable about at least one axis.

117. (New, amended) The optical system of claim [[[116]]] 111 wherein each channel micromirror is pivotable about at least one axis.

118. (New, amended) The optical system of claim [[[116]]] 111 wherein each channel micromirror is a silicon micromachined mirror.

119. (New, amended) The optical system of claim [[[116]]] 111 wherein said beam-focuser comprises a focusing lens having first and second focal points, and wherein said wavelength-separator and said channel micromirrors are placed respectively at said first and second focal points.

120. (New, amended) The optical system of claim [[[116]]] 111 wherein said wavelength-separator comprises an element selected from the group consisting of ruled diffraction gratings, holographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing prisms.

121. (New, amended) The optical system of claim [[[116]]] 111 further comprising a quarter-wave plate optically interposed between said wavelength-separator and said channel micromirrors.

122. (New, amended) The optical system of claim [[[116]]] 111 further comprising an auxiliary wavelength-separating-routing apparatus, including:

a) multiple auxiliary fiber collimators, providing and serving as a plurality of auxiliary input ports; [[[and]]]

b) an exiting port;

[[[b]]] c) an auxiliary wavelength-separator;

[[[c]]] d) an auxiliary beam-focuser; and

[[[d]]] e) a spatial array of auxiliary channel micromirrors;

wherein

said subset of said spectral channels in said fiber collimator pass-through port and one or more add spectral channels are directed into said fiber collimator auxiliary input ports, and multiplexed into an output optical signal directed into said [[[fiber collimator]]] exiting port by way of said auxiliary wavelength-separator, said auxiliary beam-focuser and said auxiliary channel micromirrors.

123. (New) The optical system of claim 122 wherein said auxiliary channel micromirrors are individually pivotable.

124. (New) The optical system of claim 122 wherein each auxiliary channel micromirror is pivotable continuously about at least one axis.

125. (New) The optical system of claim 122 wherein each auxiliary channel micromirror is a silicon micromachined mirror.

126. (New) The optical system of claim 122 wherein said auxiliary wavelength-separator comprises an element selected from the group consisting of ruled diffraction gratings, holographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing prisms.

127. (New, amended) The optical system of claim [[[127]]] 122 wherein said fiber collimator pass-through port constitutes one of said fiber collimator auxiliary input ports.

128. (New, amended) A method of performing dynamic wavelength separating and routing, comprising:

a) receiving a multi-wavelength optical signal from a fiber collimator input port;

b) separating said multi-wavelength optical signal into multiple spectral channels;

c) focusing said spectral channels onto a spatial array of corresponding beam-deflecting elements, whereby each beam-deflecting element receives one of said spectral channels; and

d) dynamically and continuously controlling said beam-deflecting elements in two dimensions to direct said spectral channels into any selected ones of [[[fiber collimator]]] output ports and to control the power of the spectral channels coupled into said selected output ports.

129. (New, amended) The method of claim [[[133]]] 128 further comprising the step of providing feedback control of said beam-deflecting elements to maintain a predetermining coupling of each spectral channel directed into one of said [[[fiber collimator]]] output ports.

130. (New, amended) The method of claim [[[134]]] 129 further comprising the step of maintaining power levels of said spectral channels directed into said [[[fiber collimator]]] output ports at a predetermining value.

131. (New, amended) The method of claim [[[133]]] 128 wherein each spectral channel is directed into a separate [[[fiber collimator]]] output port.

132. (New, amended) The method of claim [[[133]]] 128 wherein a subset of said spectral channels is directed into one of said [[[fiber collimator]]] output ports, thereby providing one or more pass-through spectral channels.

133. (New, amended) The method of claim [[[137]]] 132 further comprising the step of multiplexing said pass-through spectral channels with one or more add spectral channels, so as to provide an output optical signal.

134. (New, amended) The method of claim [[[133]]] 128 wherein said beam-deflecting elements comprise an array of silicon micromachined mirrors.

135. (New, amended) The wavelength-separating-routing apparatus of claim [[[73]]] 68, wherein neither said multi-wavelength optical signal nor said spectral channels are transmitted through a circulator.

136. (New, amended) The servo-based optical apparatus of claim [[[93]]] 88, wherein neither said multi-wavelength optical signal nor said spectral channels are transmitted through a circulator.

137. (New, amended) The optical apparatus of claim [[[103]]] 98, wherein neither said multi-wavelength optical signal nor said spectral channels are transmitted through a circulator.

138. (New, amended) The optical apparatus of claim [[[109]]] 104, wherein neither said multi-wavelength optical signal nor said spectral channels are transmitted through a circulator.

139. (New, amended) The optical system of claim [[[116]]] 111, wherein neither said multi-wavelength optical signal nor said spectral channels are transmitted through a circulator.